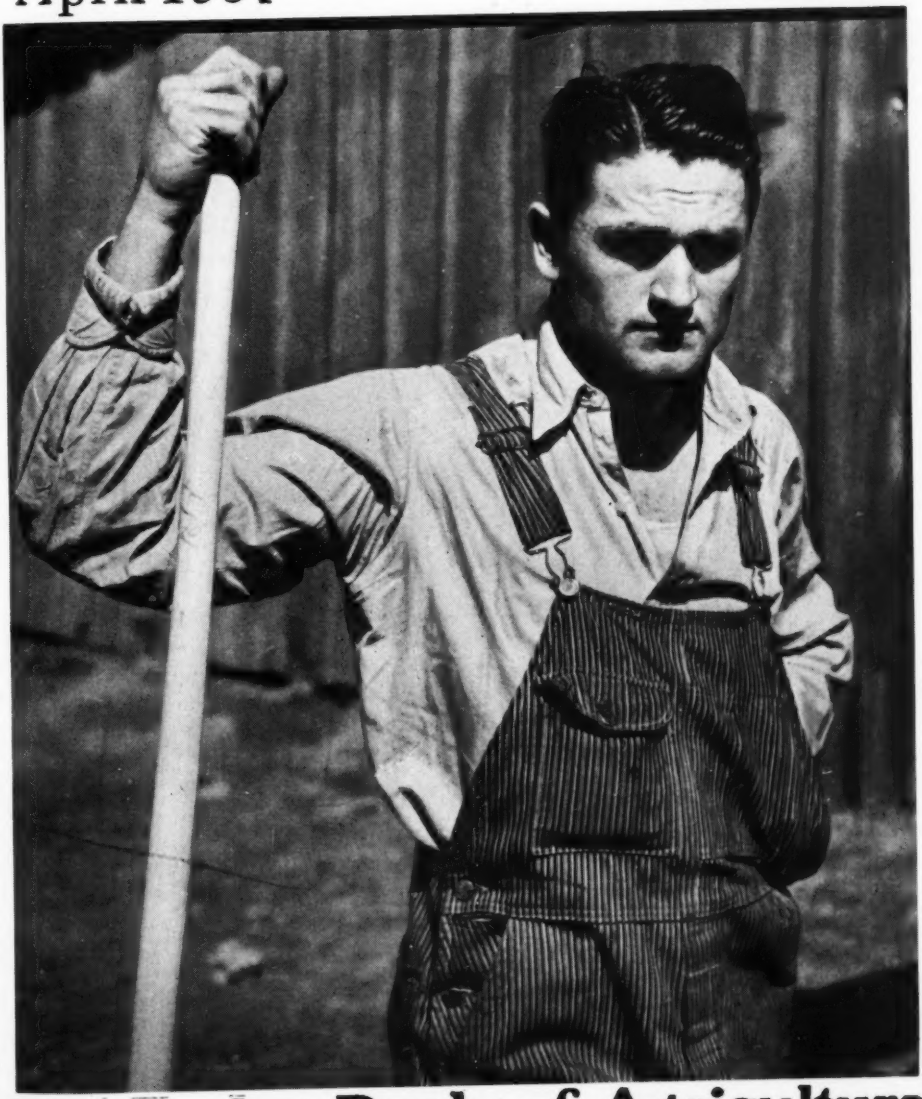
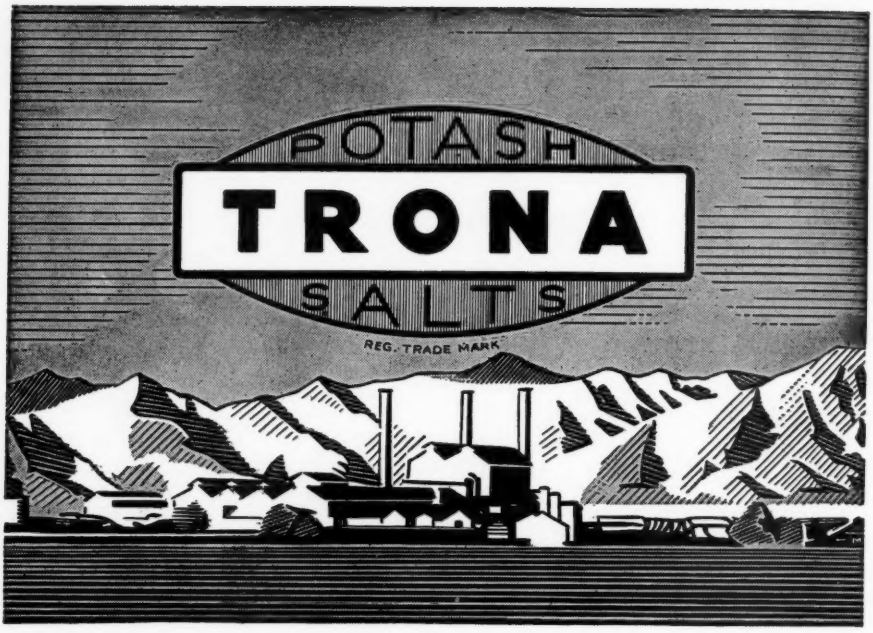
Better Crops WITH PLANT FOOD

April 1937 10 Cents



The Pocket Book of Agriculture



Trona on Searles Lake, California

TRONA MURIATE of POTASH

"Potash is the *quality* element in the fertilizer mixture. It not only increases yields, but gives to fruits and vegetables the finish and keeping quality which bring best market prices. Potash improves the burning quality of tobacco, and the shape and cooking quality of potatoes. It promotes the growth of clover in pastures, and produces better stands of alfalfa."

American Potash & Chemical Corporation

70 Pine Street New York

Sales Offices

Atlanta, Ga. Baltimore, Md. Chicago, Ill.

PIONEER PRODUCERS OF MURIATE IN AMERICA

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C

VOLUME XXI NUMBER SIX

TABLE OF CONTENTS, APRIL 1937

Sit-down Plowing 3
Jeff Strikes for Privileges

Feeding Cattle Minerals Through Better Pastures 6
Has Practical Advantages, Says N. J. Thomas

Results with Potash in Eastern Virginia 9
J. B. Hester and J. M. Blume Discuss Vegetables

A Modern Pioneer—J. W. Hadden 13
Ben Hilbun Describes a Successful Farm Career

Growing No. 1 Tomatoes for Hoosier Canners 14
Means Quantity and Quality Products, According to R. Fraser

701 Bushels per Acre Broke the Record 18
Roy F. Thomas Interviews the Champion

Fertilizers for Better Asparagus 20
Profitable Recommendations by Robert E. Young

Editorials 27

Reviews 29

American Potash Institute, Inc.
Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*
G. J. CALLISTER, *Vice-President and Secretary*

SPRING—ABOVE AND BELOW.

Better Crops with PLANT FOOD

PUBLISHED FOR THE AMERICAN POTASH INSTITUTE, INC., INVESTMENT BUILDING, WASHINGTON, D. C. SUBSCRIPTION, $1.00 FOR 12 ISSUES; 10c PER COPY. COPYRIGHT, 1937, BY THE BETTER CROPS PUBLISHING CORPORATION.

VOL. XXI WASHINGTON, D. C., APRIL 1937 No. 6

There is much to be gained from--

Sit-down Plowing

Jeff McDermid

LABOR leaders using the imported and effective idea of sit-down occupancy have nothing on the mechanized and modernized American farmer. For everywhere on the far-flung reaches of the belly-filling belt our operators have enjoyed sit-down plowing and be-seated seeding for a number of determined decades.

Of course, there is a shade of difference in the objectives. Sit-downers of industry assume a posterior position on another man's property because they hope to hold down a situation by their own weight and the weight of public necessity so as to pry loose a little more precious privilege.

Farmers on the other hand found out how to be productive and comfortable on their own acreage by the sit-down method. Being planters from time immemorial, they have contrived to plant corn and oats while they peacefully plant the seats of their pants on the time-honored but air-conditioned saddles of sulky plows and snorting tractors.

The "privilege" part of the scheme for them has only been a recent by-product—but its arrival is due to the quicker response of rural minds when freed from the bunions and backaches which kept their fathers yoked with the patient oxen. Instead of celebrating the invention of the steel plowshare as the salvation of agriculture, let's hunt up the firm whose ingenuity

first lifted the plodder from the furrow and placed him like a lord on the load!

A few of us yet remain whose experience antedates the pushing period of easeful implementation in farming. We painfully recall enforced absence from the swimming hole and the ball ground, enmeshed by seasonal fate and parental command in the web of "agricultural athletics."

THEY said it was good for our muscles to yank the cultivator and the one-hoss plow, while the spraddling stride assumed in the wake of the shovels and shares was conducive to a better toe-hold on the universe, even better than wrestling. Our calico shirt became loose at the throat, and the sawing reins wore welts and blisters on a scrawny neck fashionably decorated with all the overtones of an Italian sunset. Before the day was over we felt all the effects of the summer spectrum, from ultra-violet rays on one extreme to red-hot tempers at the other.

And no warm welcome awaited the gumbo-footed slave upon seeking his couch by night, fifteen minutes ahead of the chickens. For Mother did all the washing herself over the corrugated back-breaker, and so she made us either lave our lower limbs in the horse-pail or encase them in gunny sacks before slithering between the sheets.

As for the application of plant food in those halcyon days, that, too, is a bitter memory. We either weaved around atop of a mushy and musky wagon-bed of smoking incense laid on the altar of Demeter, forking it out in floppy gobs or wind-casting it from strawy loads; or we dispensed manure and ashes along the expectant garden-rows from a lop-sided wheelbarrow, much in need of knee action and a self-starter.

As a result the meadows took on a spotty, greenish hue from ineffective distribution, and the garden yielded more old horseshoes, rusty nails, and wagon-bolts than it did esculent herbs and vitamins.

Lucky indeed was the lad residing on a sheep or a chicken ranch in those muscling-in, non-stop days of agriculture. Peradventure the bulk of their nitrogen spreading would be done automatically, which was the first evidence of rural common sense in fertilizer application. Its chief objection, however, was the lack of discrimination evinced by those domestic fauna, particularly the geese and ducks, who spent too much of their time squawking and spreading in the immediate door-yard. I am confident that the richest land in the entire corn-belt lies within two rods of the kitchen doors! This fact has been overlooked in Form 57, Series X-J, issued by the S. C. D. A. through what's left of the AAA.

Through the dusty days of flail and horse-power grain separation, the period of threshing was a spell of heat and turmoil. It came to be regarded as hatefully as taking a licking, from whence no doubt came the synonymous use of the term.

ALL of which observation leads to the prompt conclusion that in former times work was the fetish and the sign-manual of the farmer. Success was and had to be measured by tough tasks and long hours. Every form of expression laid all the fruits and blessings of rural life to unremitting work. The art of other days pictured farmers as the benign, resigned, romantic acolytes of toil. There were such popular pictures as the Gleaners, the Angelus, the Song of the Lark, and the Man with the Hoe. The "genre" painters left their saintly church murals in the nineteenth century to depict the glory of husbandry in terms of sweat, rough duds, dull eyes, and blistered knuckles. These impressionists were good pictorial reporters, too, and their canvas caught

the fancy of the elect and soon became familiar in warehouse lithographs and sitting-room chromos. Their brushes caught the sunshine and the shadow of the meads and woodlands, but hardly a flicker of their joy and beauty was

reflected in the faces of the soil serfs in the foreground.

Mid-century immigrants to America had no other thought than to grind betimes from dawn to dark, in order to keep pace with the step-up system existing then in a land of liberty which had yet invented no respite for the sons of Cain. No wonder the first mechanical inventions were classed with the likes of the lazy!

NEITHER were the harsh lessons of labor forgotten in church or school. From the Hoosier school-master clear down to the 90's dominated by the traditional mush and morality of McGuffey's axioms and flayed by the gloomy pedantry of revival elders exhorting sinners in the wilderness, congregations and assemblies of young and old had the same dreary doctrine of self-sacrifice at the plow-handle and the grub-hoe beaten firmly into their skulls. It was either work constantly or catch hell, and sometimes it was both!

It strikes me that the religion of those days taught the polar opposite to the economics then prevailing. The deacons insisted that individualism counted for little besides self-castigation, utter humility, and subjection. Yet the economic theory of those times played up the rugged independence of man facing a continental conquest. Thus we had the sacrifice of the church and the selfishness of commerce doled out simultaneously to the settlers of the Midwest. Our poor ancestors were asked to accept both and govern themselves accordingly.

IT is reasonable at this point, in explanation, to emphasize our belief in accomplishment and achievement, and to renounce the doctrine of sloth and inaction. No true American can turn his back on earnest and honest labor, but at the same time he should not offer foolish idolatry to senseless toil which maims the mind and blurs the vision to the wonders of a glorious countryside. Have we clung too long, even in these sit-down plowing days, to an inherent right to leisure and its golden opportunity?

My township once held a few strange souls who rarely had the chance, but sometimes took it, of deep communion with the myriad of unknown facts and mystic forces surrounding their scythes and spades. One of these men was a Scandinavian botanist and naturalist, who sometimes stole a moment from the plow to chase a butterfly or pick a lowland orchid. A neighbor woman took half an hour each day to study bird-life with notebook and references, which culminated finally in her fifties in a useful treatise for the common schools. Still another friend felt the presence of the sunsets and the purple shadows

(*Turn to page* 44)

Mineral feeding experiment on the Ackert farm. These cattle on pasture were supplied salt alone, no bone meal. Note rough, dry coat.

Feeding Cattle Minerals Through Better Pastures

By N. J. Thomas

Specialist in Soil Fertility, Ontario Agricultural College, Guelph, Ontario.

PRACTICAL cattle men of many years of experience made soil surveys and classified them long before soil scientists ever began a systematic study of the problem. The only difference in the methods used was that soil scientists classified soils on their physical and chemical characteristics, whereas the farmers classified them not only on their ability to produce volume of crop, but on the nutritional value of the crops.

Farms were known for their ability to produce abundant fodder of various kinds, or even if not heavy producers of crop, they would grow and fatten cattle exceptionally well. This fact was so firmly established that farmers were quite willing to pay more per acre either in purchase or rental for such lands of good repute. Possibly this condition is more clearly exemplified in pasture lands than cropped lands, where the influence of soil fertility and crop quality is so discernible in the effects on the cattle within one season. In the experience of the writer, the widest extreme known is where a cattle man will gladly pay an annual rental of $5.00 per acre for pasture, while another area producing more grass he will not take as a gift, knowing it would not fatten cattle.

With the advance of soil science and chemistry, the findings of the

TABLE I.*—FARM NO. 77 FARM NO. 69

	Excellent fattening qualities				Non-fattening qualities			
	Total ash	N %	P %	Ca %	Total ash	N %	P %	Ca %
Red Clover	7.02	2.62	.199	2.310	6.13	2.38	.139	1.716
Sweet Clover	8.63	3.09	.233	2.165	5.30	1.77	.113	1.466
Trefoil	6.93	2.90	.248	2.475	6.51	2.53	.151	1.852
Can. Bluegrass	7.06	1.21	.176	.464	5.15	1.00	.082	.343
Ky. Bluegrass	7.62	.90	.146	.406	6.06	1.07	.099	.480
Timothy	9.59	1.03	.167	.442	5.07	1.04	.106	.340
Red Top	9.14	1.27	.183	.468	8.73	1.01	.103	.329

* Figures on moisture-free basis.

practical farmer have been verified, and part of the reason why has been determined. It is well known now that soil types differ in their inherent physical and chemical characteristics. There is also a relation between the chemical composition of the soil and the nutritional value of the feed produced, with its consequent effect on the health of the animal. For example, there are relatively large areas in this Province where the cattle suffer from phosphorus deficiency due to a very low available phosphorus content in the soil.

During the summer of 1936, a soil survey was made in one of the important, extensive beef-grazing areas of the Province. Samples of pure species of the herbage were also secured and the calcium and phosphorus contents determined in order to find the relationship between soil type and the mineral nutritional value of the herbage. The results indicate that a wide variation exists in the percentage of calcium and phosphorus content of the same species of plants growing on different soil types.

The above table presents the analyses of pure species of herbage obtained from two farms typical of areas where cattle do exceptionally well, and where livestock gains are

In the same experiment cattle on pasture were supplied a mixture of equal parts of bone meal and salt. Note smooth, well-finished, and thrifty appearance.

very small with continual symptoms of mineral deficiency exhibited by a depraved appetite.

Farm No. 77 is located on Brookston silt loam soil type, with a $KHSO_4$-soluble phosphorus content of over 368 lbs. per acre and ammonium acetate replaceable potassium content of 160 lbs. per acre. Farm No. 69 is located on a Berrien sandy loam with a $KHSO_4$-soluble phosphorus content of only 84 lbs. per acre and an ammonium acetate replaceable potassium content of 270 lbs. per acre. The grass grows in abundance on both fields, which have been in pasture for over 30 years, with the dominating herbage approximately the same.

As part of the Provincial Pasture Improvement Program, experiments have been conducted with beef cattle in two very extensive grazing areas. In the Ailsa Craig area, individual gains in weight from May to October will be from 350 to 400 lbs., whereas in the Holyrood area, using cattle of similar age and breeding, in the same period gains of 250 to 300 lbs. each are considered very good. The botanical compositions of the swards are similar, with an average grazing capacity of 20 head per 100 acres for the full season.

As it was known that the soils in the Holyrood area were very low in available phosphorus, it was thought the difference was due to this factor. Subsequent analyses of the soils and herbage from these two areas in 1936 proved this point, as shown in the following table. The samples were taken from natural untreated soils and are typical of the two areas.

TABLE II*—COMPARISON OF ANALYSES OF UNTREATED NATURAL HERBAGE

Species	Ailsa Craig area				Holyrood area			
	Total ash	N %	P %	Ca %	Total ash	N %	P %	Ca %
Trefoil	6.78	1.25	.151	1.692	5.58	2.44	.147	1.409
Can. Bluegrass	10.50	1.13	.127	.363	6.26	1.22	.100	.258
Ky. Bluegrass	8.22	.95	.142	.364	4.36	1.13	.113	.333
Timothy	4.30	2.42	.176	.371	5.35	.98	.129	.292
Red Top	9.17	1.17	.174	.342	6.72	1.20	.132	.372

* Figures on moisture-free basis.

To obtain information as to whether the lower gains were due to a lack of phosphorus in the diet, an experiment was set up in the spring of 1935 in which one group of steers on grass received salt alone and a second group received a mixture of equal parts of salt and bone meal. The results of group No. 2 in improved appearance, live weight gains, shipping shrinkage, and dressed per cent were so marked that the work was continued.

Is It Possible?

The question always in the mind of soil fertility students is: Can the minerals be fed to the animal through the soil and plant as well as in the trough? In other words, by improving the fertility of the soil can we improve the cattle? Also, from the livestock man's point, will the continued use of fertilizers with good soil management be ultimately reflected in the health and quality of livestock?

Early in the spring of 1936 a third plot was added to the two of the previous season. This was fertilized with a 2-12-10 mixture at 300 lbs. per acre and stocked with cattle of good uniform quality. The following table presents the results of the gains on grass and financial returns.

It will be observed that the bone meal and salt group made slightly better gains than the salt alone group, and after deducting the full cost of bone meal there was an increase in

(*Turn to page* 39)

Results With Potash In Eastern Virginia

By Jackson B. Hester and J. M. Blume
Virginia Truck Experiment Station, Norfolk, Virginia

THE horticulturist and agronomist have agreed that almost every field has a different potash-supplying power from that of every other field. They have further agreed that before a true scientific approach to the fertilization programs can be launched some system of evaluating the fertility of the different fields must be available. While long years of research in a particular community have established the fact that a certain fertilizer formula has given consistently the best yield for a particular crop, still it is recognized that this fertilizer is not the best for all the soils. Further, it has been shown that applied potash is less effective on some soils than on others. For example, potash was less than one-half as available on the Bladen sandy loam as it was on the Norfolk and Portsmouth soils. Thus, a knowledge of the available potash, the supplying power, and fixing power of the various soils is valuable.

During the course of the past 4 years a system of evaluating the fertility of vegetable soils in eastern Virginia has been evolved. While this system is by no means perfect, it has served as a working basis for locating fertilizer tests and making recommendations for soil amendments. The present paper deals with the results obtained from the fertilizer studies conducted during the past year on the basis of the soil fertility tests.

A description of the system of evaluating the soil fertility has been given in the Station literature. This system is based on extracting a representative soil sample with a dilute solution of sodium acetate-acetic acid

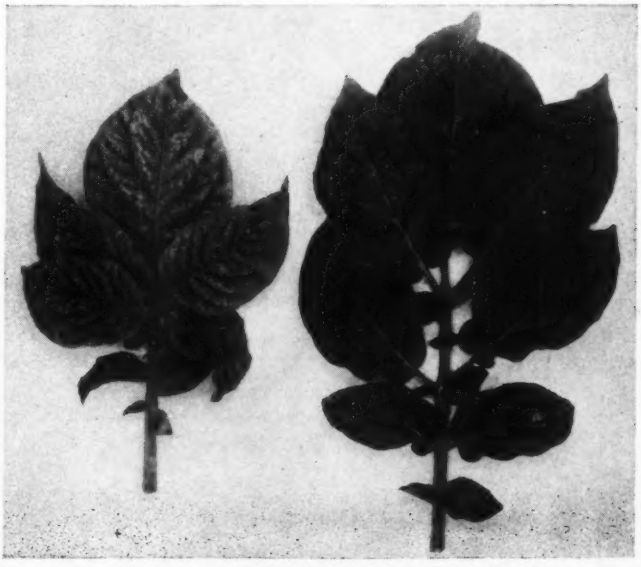


Fig. 1—A comparison of a potash deficient potato leaf (left) with a normal leaf (right).

mixture (pH 5.0) and testing for the soil constituents extracted.

In predicting crop response on the basis of the soil tests for respective elements many factors must be taken into consideration before a proper correlation with crop yields can be considered. First, in evaluating the fertility of the soil for potash, one is dealing with the chemically available potash. This must be recognized before the true, plant available potash is considered. Plants have different requirements for potash and exert different powers for absorbing the potash from the soil, depending upon the length of season, moisture, etc. The results of a fertility test may have the following relation to plant utilization: If a soil shows a high level of available potash but is too acid for the growth of the crop concerned, then the potash cannot be utilized by the plant. But, if the plant can thrive upon acid soil the potash will be utilized.

A situation that is more complicated may be indicated in the following illustration: Suppose the soil test shows sufficient potash for the crop concerned but also indicates an excess of calcium and a high pH value. Chemically the potash is available, but due to the wide calcium-potassium ratio the plant is unable to take up sufficient potash. Therefore, more than a normal supply of potash is needed to bring the soil solution into balance. Thus, to properly evaluate the fertility of the soil in regard to potash fertilization a knowledge of the soil reaction, supplying power for phosphorus, magnesium, nitrate, ammonia nitrogen, etc., is necessary.

Other Factors

A number of other factors which decrease crop yield may be mentioned, such as other nutritional disorders, climatic conditions, disease, etc. These factors are given for the purpose of illustrating the fact that field plats must be planned with considerable detail, and the data from these plats must be analyzed with the utmost care.

No good color reagent for potash has yet been developed. Consequently, the rapid tests thus far developed must rely upon some turbidity method with the di-sodium cobalti-nitrite reagent. The colloid formed is a sodium potassium cobalti-nitrite and may be estimated by a variety of turbidimetric methods. Since the concentration of potash and other ions in the solution, temperature and light influence the

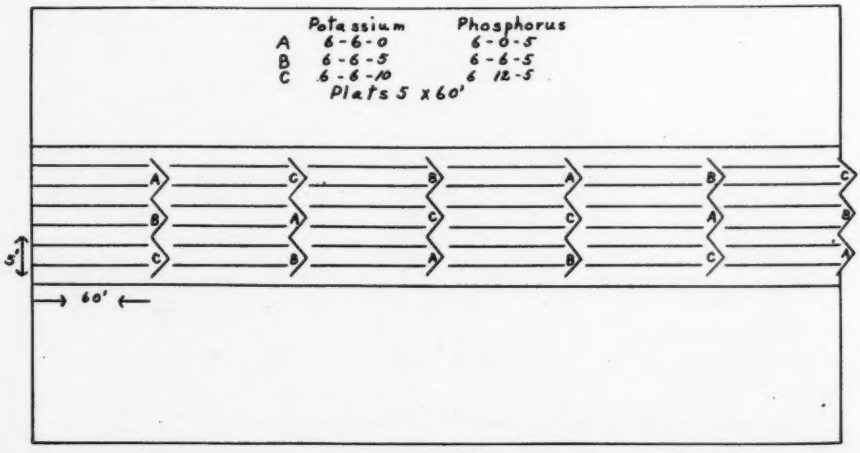


Fig. 2—The arrangement of field plats in commercial grower's field.

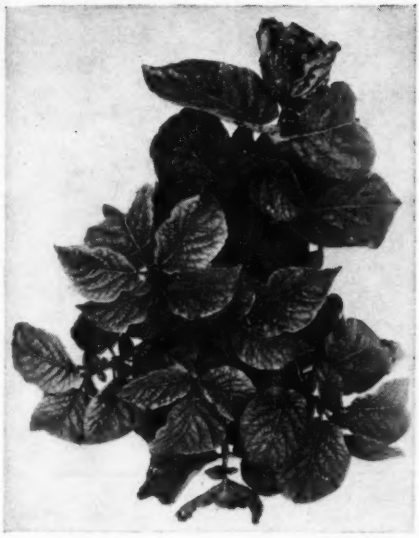


Fig. 3—Potato plant from a Moyock fine sandy loam showing an extreme deficiency of potash. The older leaves show the characteristic break down of the tissue between the veins. The younger leaves show a yellow mottling with marginal browning. During certain parts of bright summer days a characteristic purplish coloration was observed on the leaves.

colloid formed, the method is not as well adapted for general use in soil testing as is desirable. A colorimetric method similar to the ones for phosphorus, magnesium, etc., would be far more easily handled. However, the methods now in use are rather reliable and serve as a basis for greenhouse and field work. The test used in this study has been so calibrated that a "good" chemical test signifies more than 100 pounds of readily available potash to the acre; a "fair" chemical test signifies between 40 and 100 pounds of readily available potash to the acre; and a "poor" test below 40 pounds to the acre. While it is realized that the potash requirements for various crops vary widely, the above quantities of readily available potash are sufficient to grow a good, fair, and poor crop respectively of several of the vegetable crops.

Although the final analysis of the value of a soil-testing system must be based upon its success in the field, much valuable information can be accumulated from studies conducted in the greenhouse. Plants vary in their power to absorb potash from the soil. Likewise, soils vary in their power to give up potash to the plant. For example, when the replaceable potash content of a Sassafras sandy loam was below 100 pounds to the acre, sweet corn was unable to obtain enough to make normal growth. A Bladen and a Moyock clay held the potassium even more strongly. There was an apparent equilibrium between the replaceable and non-replaceable potassium but it was of little consequence for a quick-growing vegetable crop.

Relative Absorption

A particularly outstanding point was learned when it was discovered that the dilute sodium acetate extracted less than one-third of the replaceable potash when the amount was less than 100 pounds to the acre, but extracted almost one-half of the replaceable potash when over 200 pounds to the acre were present. This meant that the soil test was a good indicator of the readily available potash, whereas it was less sensitive to the more difficultly available. When the supply is low the plant absorbs little potash, but when the supply is adequate it absorbs more abundantly.

All in all, the pot studies have brought out several very fundamental principles that must apply in the fields under ideal conditions, and to a less extent, under adverse conditions.

In the spring of 1936 an attempt was made to locate plats on soils that showed a good, fair, and poor potash level and a fair phosphorus level. Such crops as beets, cabbage, peas, and potatoes were studied. These tests were conducted with growers, using the same practices with which they handled their crops. Simple fertilizer mixtures, such as 6-6-0 (N-P-K), 6-6-5, and 6-6-10 were used. Each

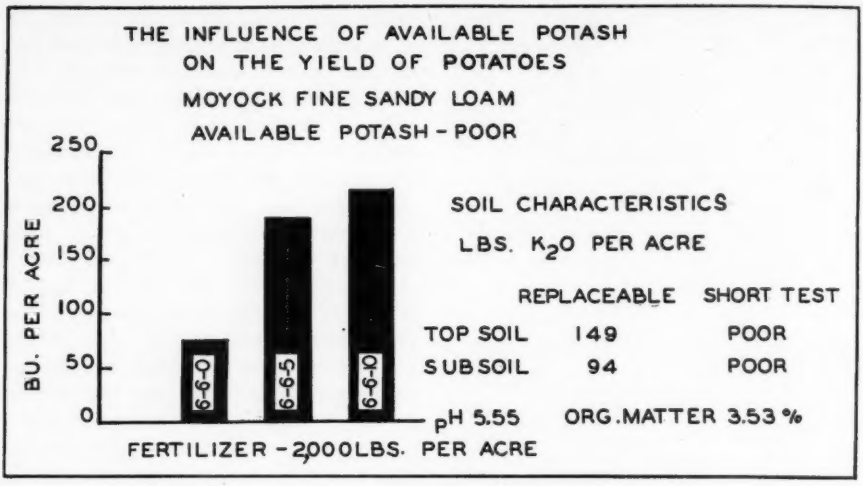


Fig. 4—The soil was well supplied with calcium and magnesium.

plat was replicated six times as shown in figure 2.

It is interesting to observe the results in figure 4. The data in this experiment were from a Moyock sandy loam that showed a poor level in both potash and phosphorus. The soil was well supplied with organic matter, calcium, magnesium, etc., as shown in table 1. The beans from the preceding crop of soybeans had been harvested, but the vines had been turned under. The 6-6-0 plat gave a yield of 74 bushels to the acre. The 6-6-5 plat yielded 194 bushels or 158 per cent increase, and the 6-6-10 plat 216 bushels or 196 per cent increase in yield. It is likely that the phosphorus was a limiting factor on the 6-6-10 plat since its original level was low. It is probable that a 6-12-10 mixture would have yielded higher than any of the mixtures tried. This experiment clearly demonstrates that where the soil level was poor in available potash, medium and high potash fertilizer gave a definite response. The increase due to the 10 per cent potash was significant over the 5 per cent fertilizers.

TABLE 1—SOME SOIL CHARACTERISTICS OF A MOYOCK FINE SANDY LOAM

	pH	Per Cent Organic Matter	Per Cent Phosphorus	Replaceable Lbs. per Acre Ca	Mg	K	Short Test K	Short Test P
Topsoil	5.55	3.53	0.09	1,660	398	124	poor	poor
Subsoil	5.8	1.04	0.05	880	398	78	poor	poor

TABLE 2—Test with Potatoes on Soil "Fair" in Available Potash, Norfolk Fine Sandy Loam

Fertilizer*	Bushels per Acre	Per Cent Increase
6-6-0	160	
6-6-5	180	12
6-6-10	180	12

*2,000 pounds to the acre.

On a Norfolk fine sandy loam that tested "fair plus" in potash and "good" in phosphorus the response noted in table 2 was evident. Here the replaceable potash was 188 pounds to the acre, about one-third higher than for the former soil, but furnished more than one-third more readily available potash. The soil again

(*Turn to page* 37)

A Modern Pioneer-- J. W. Hadden

By Ben Hilbun
Agricultural Experiment Station, State College, Mississippi

J. W. HADDEN, after years of seeking, found what he was looking for — financial independence and contentment—on the hills and valleys of a Newton County, Miss., farm. For 5 years Hadden served as agricultural extension agent in Noxubee and Scott Counties, and then filled a 2-year contract with the State of Minas Gereas, Brazil, as cotton specialist, before launching a successful farming career in 1930.

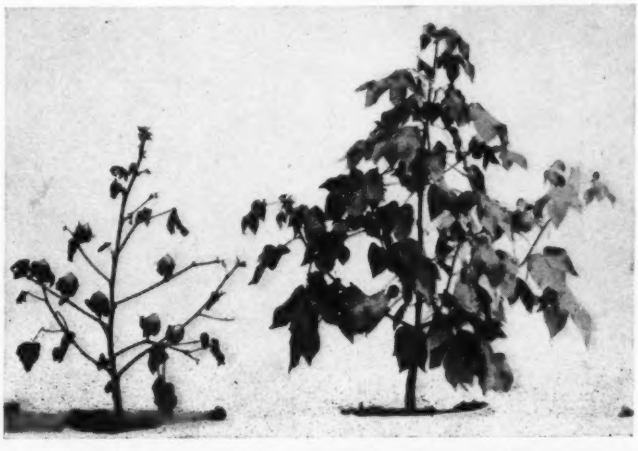
Hadden saw possibilities in ordinary hill land, but didn't cash in the first year, when 78 acres of cotton panned out only 13 bales. He believed that fertilizer would turn the trick, and immediately began a series of tests that verified his judgment. Four years later (1935) he harvested 78 bales of cotton from 63 acres, and the fact that it was long staple cotton made the yield all the more impressive.

He figured that staple cotton would grow most anywhere in the cotton belt if the proper balance of plant food was placed in the soil. Rust, a common disease on hill and sandy bottom land, cut his first crop short. He knew that rust was caused by potash deficiency, and immediately began running tests of varying amounts of potash to get at the quantity that could be economically applied to his land. Starting with 200 lbs. per acre, he ran up the amount during the third and fourth years to 600 lbs. per acre, and even went as high as 800 lbs. per acre.

The 200-lb. application stopped rust. He was sure of that, for he used the farms of his neighbors as checks. His cotton remained green, while his neighbors' cotton rusted out at the height of the fruiting season. He combined the potash with 400 lbs. of superphosphate and 200 lbs. of nitrate of soda to get excellent results.

In 1935, Hadden applied 200 lbs. muriate of potash, 400 lbs. of super-

(*Turn to page* 44)



Cotton rust can be controlled with potash. Left: Potash starved and badly rusted. Right: Well-fed with potash and normal.

Growing No. 1 Tomatoes For Hoosier Canners

By Roscoe Fraser

Muck Crop Specialist, Purdue University Agricultural Extension Service, Lafayette, Indiana

THE Hoosier tomato canning industry has developed until today Indiana stands out as the leader in packing not only quantity but also quality tomato products. The acreage of tomatoes grown for canning factories in Indiana has increased from 18,472 acres in 1910 to 110,000 acres in 1936. Tomatoes play an important part in a farmer's diversified program. They provide a cash crop and one which has a beneficial influence upon crops which follow in the rotation. Tomatoes require an abundance of plant food to make a good crop, but a large amount of this plant food is left in the green fruits, leaves, stems, and roots after the plants are killed by frost and consequently is returned to the soil.

Fertile Soil Needed

Tomatoes are grown on a wide range of soil types. For the best results the land must be well drained, in a high state of fertility, and in good physical condition. Loams and silt loams best meet the requirements of tomatoes. Light colored, sandy soils usually produce a low percentage of U. S. No. 1 tomatoes unless such soils are high in organic matter and have an abundance of available plant food. On the evidence of 5 years of tomato tagging work by the Purdue University Agricultural Experiment Station in various growers' fields, there seems to be little difference in the percentage of U. S. No. 1's produced on black and clay soils of the same relative fertility.

Green manures together with commercial fertilizer can maintain or increase the crops produced on soils which have previously been poorly farmed. Most crop rotations can be adjusted to get more organic matter incorporated into the soil, even though little barnyard manure is available. (See table for suggested rotations.) Organic matter increases the water-holding capacity of soil as well as improving its tilth and biological conditions.

Green manure crops of deep-rooted legumes like alfalfa and sweet clover add organic matter and nitrogen, and their roots penetrate the subsoils. A good stand of sweet clover plowed under as green manure will add as much as 200 pounds of nitrogen per acre to the soil. About two-thirds of this nitrogen is obtained from the air. Where the hay crop is cut and removed from the soil, there is little or no increase of nitrogen in the soil from the growing legumes. Soybeans are shallow-rooted but if properly inoculated do supply organic matter and nitrogen. Rye may be sown in the fall as an intercrop to be plowed down early the next spring. The application of fertilizer to a green manure crop is desirable from the standpoint of increasing the yield of the green manure.

Plow under green manures before maturity and when still succulent, as the material will decompose more

* Dr. J. H. MacGillivray, formerly on the Purdue Staff, cooperated in preparation of this article.

SUGGESTED 4-YEAR CROP ROTATIONS FOR TOMATOES

For Sweet or Slightly Acid Soils	Corn (Rye-intercrop)	Soybeans	Wheat or oats (Sweet clover-intercrop)	Tomatoes (Rye-intercrop)
	Corn	Wheat (Alfalfa seeding)	Alfalfa	Tomatoes (Rye-intercrop)
For Acid Soils	Corn (Rye-intercrop)	Soybeans	Wheat or oats (Soybeans or Rye[1]-intercrop)	Tomatoes (Rye-intercrop)
	Corn	Wheat (Korean lespedeza seeding)	Korean lespedeza	Tomatoes (Rye-intercrop)

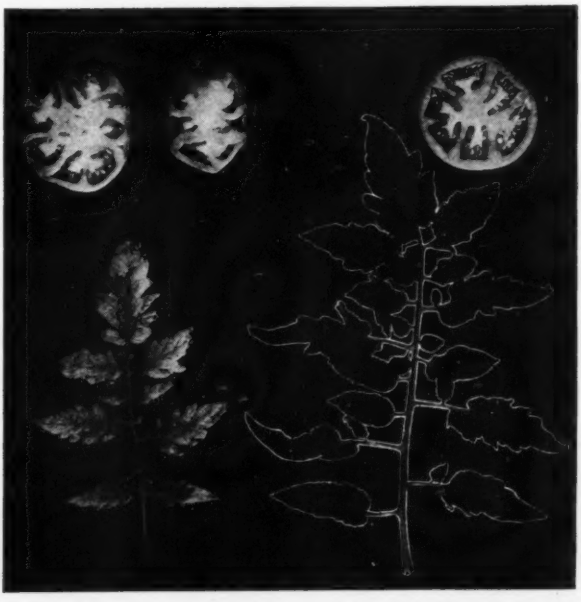
[1] Top-dress rye in early spring with 100-200 pounds per acre of ammonium sulfate, cyanamid, or other nitrogen carrier. Plow under rye 2 weeks before planting tomatoes.

rapidly. When plowing green manure crops, as rye, in the spring, turn under at least 2 weeks before planting time.

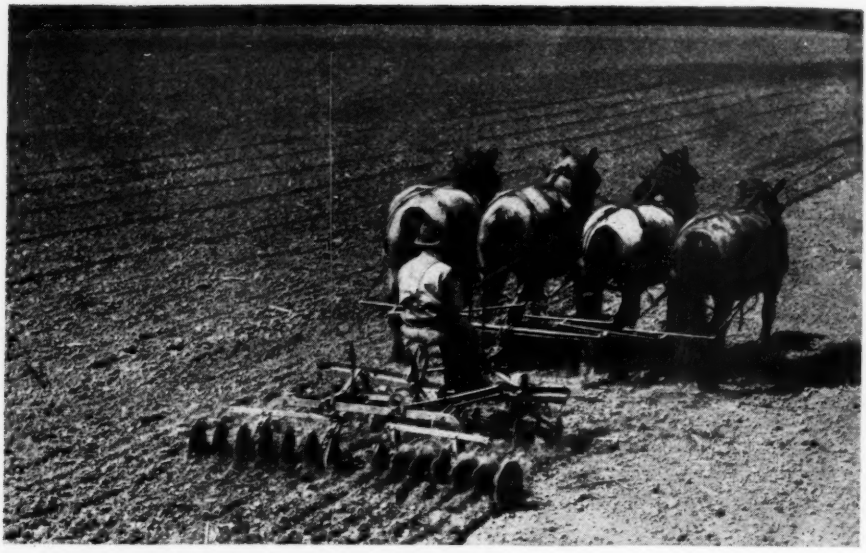
Applications of manure are very desirable in tomato production, not only because manure increases the plant-food supply and microbiological activity, but also because it increases the water-holding capacity of the soil and the organic matter which is supplying nitrates throughout the growing season. On dark-colored soils where tomato vines already have a tendency of growing too rank, it is best to reduce the manure applications on tomatoes, and put it on lighter-colored soils for corn and other crops.

Manure applications should be made before the ground is plowed. Where available, 10 tons or more of manure per acre should be used. One ton of average manure supplies plant food equivalent to 100 pounds of 10-5-10 fertilizer. Many profitable tomato crops are the result of generous amounts of plant food supplied by manure. Do not plow under strawy manure just before planting.

For soils high in organic matter, where winter cover crops are not used, and on which there is no danger of erosion, deep (8 inches) fall plowing is best. The fall plowing provides better mechanical condition and greater water-holding capacity. It also helps control disease and insect



Left: Potash starvation—hollow, ribbed, irregularly ripened fruit; leaves yellowed with greenish-tinted veins. Right: A healthy tomato leaf and fruit.



The same care as would be given garden seedbed preparation should be used for tomatoes.

pests. In the spring, shallow working of the soil to kill weeds is recommended.

Simple tests for determining soil acidity and availability of phosphates and potash in soils have been developed recently (Circular No. 204, Purdue University Agricultural Experiment Station) and are now being used by extension workers, county agents, vocational teachers, and canning factory fieldmen. These simple chemical tests indicate when the supplies of available phosphates or potash are so low that crops will be retarded if extra plant foods are not supplied with fertilizers. More dependable fertilizer recommendations can be made following the use of these tests on a soil.

In speaking of acidity, the term pH is being used commonly. This is merely a numerical method of expressing acidity: pH 7 is neutral; 7 to 8 alkaline or sweet; 6 to 7 slightly acid; 5 to 6 medium acid; and 4 to 5 strongly acid. Clover and alfalfa grow best at a pH of 6.5 to 6.8. Many authorities claim that the phosphate and potash in a soil are most efficient for the plant at a pH of 6.2 to 6.5; therefore, it would seem that the most desirable pH for tomato growing would be between 6.2 and 6.5, although profitable crops of tomatoes may be grown on soils as low as 5.5.

Recommended Fertilizers

On practically all soils, applications of 400 to 600 pounds of the proper commercial fertilizer per acre will pay on tomatoes. The analysis of fertilizer to use may be obtained through a knowledge of the type of soil, its past history, Purdue University Agricultural Experiment Station recommendations based upon the state experimental fields, and through the use of recently developed Purdue soil and plant tissue tests.

As general recommendations, clay soils of light color and acid reaction should receive a 2-16-8 or 2-12-6 fertilizer; dark sands and white slash soils, 2-8-16; sandy loams of a light color, 2-8-10 or 3-12-12; dark-colored loams, silt, and clay loams, 0-12-12 or 3-12-12 if the previous crop was not a legume. On a soil that has been heavily manured, a little

Tomatoes should be cultivated often, but very shallow, to destroy weeds without injuring the roots.

less nitrogen and potash may be needed. In the above fertilizer recommendations, many times the actual plant food can be bought cheaper in a one-and-one-half or double-strength fertilizer, for example, a 3-18-9 rather than a 2-12-6.

On soils low in nitrogen, it is often profitable to side-dress or top-dress with 100 or 150 pounds of nitrate of soda or ammonium sulphate, just before the last cultivation. Care should be used in applying either of these materials, so that it does not come in contact with the leaves when they are wet, as it will burn them.

Proper Application

It has been customary in the past to apply fertilizers broadcast with a grain drill, but recent fertilizer experiments have demonstrated that by placing the fertilizer in bands along the side of the plant, the fertilizer is used more effectively. Where the fertilizer is placed in bands, it tends to prevent the fixation of portions of the fertilizer by the soil and consequently a greater proportion is available to the plants. The bands of fertilizer are located so the material is easily accessible to the root system of the young plant.

For the most economical and efficient use, the fertilizer should be applied in bands on each side of the plant, about 3 or 4 inches away from the stalk and at a depth of 4 or 5 inches. Some of the new transplanters will apply the fertilizer in this manner. A two-row corn planter with fertilizer attachment may be used for applying the fertilizer in bands before setting the tomatoes. The corn planter is driven across the field and on the return trip is brought back so that the wheels are about 6 or 8 inches to the side of the wheel marks on the first trip.

Another method of applying fertilizer is by using a one-horse wheat fertilizer drill, stopping up the two outer holes. This places the fertilizer in three bands within a space of 14 inches. The drill should be set as deep as possible, in order to get the fertilizer well down into moist dirt. Many farmers drive the fertilizer drill on the mark made by the marker of the tomato setter and have a spring

(*Turn to page* 41)

701 Bushels per Acre Broke the Record

By Roy F. Thomas
Houlton, Maine

INTELLIGENT methods in growing white potatoes made it possible in 1936 for Frank R. Shaw, of Presque Isle, Aroostook County, Me., to break the Maine potato-yield record that had stood for 47 years. He harvested 701 bushels per acre, and made the record on 2½ acres of Chippewa potatoes that yielded 1,753 bushels of excellent quality.

Prepared for Success

Born on a farm in Carleton County, New Brunswick, Canada, Mr. Shaw followed the blacksmith trade in Presque Isle for 22 years. During that time he came in contact with hundreds of Aroostook County potato farmers. This gave him an excellent opportunity to meet the best and to learn their practices in growing the crop. Keen observation of good methods and an abundance of common sense provided Frank Shaw with a fund of information about growing potatoes. Thus, in 1932, when he purchased a 120-acre farm in Presque Isle, he was qualified to grow potatoes, and his Aroostook County neighbors all agree that he has done an excellent job of it.

Mr. Shaw plants about 50 acres of potatoes a year, all of which are certified. The principal varieties are Green Mountains, Cobblers, and Chippewas. The short time that he has owned the farm has not given him an opportunity to adjust his rotation to conform with what he considers the proper one for his farm and the number of acres of potatoes he wishes to plant.

The excellent results thus far obtained have been made on fields which have been planted to potatoes for several years. In fact, the Maine potato yield record which he broke was made under practically the same conditions. He does intend to follow a 2-year rotation by planting potatoes on a field 1 year, seeding it down the next spring with an annual legume like crimson clover, and plowing it under that fall to provide humus. The next spring it will be planted to potatoes.

Important Factors

There are a number of factors in growing potatoes which Mr. Shaw regards with a great deal of weight. Some of these are:

1. Deep plowing. He is convinced that, in order to produce a big per-acre yield, one must have a seedbed deep enough and fine enough to invite the development of an extensive root system and allow the making of a big hill on the row so as to provide ample space for the subsequent development of the tubers. This he does by plowing to the depth of from 9 to 11 inches.

2. Liberal amounts of good seed. He uses cut seed averaging 2 ounces in size and drops through his planter 10 barrels (27.5 bushels) on each acre. The best certified seed is none too good for him. All of his seed is treated with corrosive sublimate before cutting, in order to eradicate any dis-

eases which may occur on the surface of the tubers.

3. Fertilizer. "On account of the short growing season in Aroostook County, an abundance of readily available plant food is absolutely essential to start the plants off quickly, to keep them growing and healthy, and to bring a finished crop of good-sized, well-developed potatoes out of the

FRANK R. SHAW

ground at harvest time," he says. As to high-potash potato fertilizers, Mr. Shaw states that he started using them because he found that the best Aroostook County growers were using them. Experience has taught him that he made a wise choice, because they produce for him a high percentage of well-shaped tubers, with few seconds and poorly-shaped ones.

To meet the needs of his 1936 crop, he applied under it 1,300 pounds of 8-16-20 fertilizer per acre. This is a per-acre application of 260 pounds of actual potash. Mr. Shaw believes that plenty of potash produces healthier plants that die down more slowly in the fall and better resist lake blight, which is so prevalent in wet years.

4. Cultivation. He cultivates often enough to keep weeds down and is very careful to keep the shoes of the cultivator and wings of the horse hoe away from the feeder rootlets of the young potato plants. Observation has taught him that many fields that were earmarked for a big yield have been permanently injured by upsetting the balance of the young plants by too close cultivation and hoeing. Another point emphasized by Mr. Shaw was that too close cultivation and hoeing drags away some of the fertilizer, thus decreasing the yield.

5. Spraying. A very important requisite in his potato production program is a timely and well-executed spray program. He uses liquid Bordeaux of the 10-10-100 strength. His spray boom is equipped with three nozzles per row so as to provide a thorough coverage of the foliage. Contrary to many growers, Mr. Shaw begins spraying when the plants are 5 to 6 inches high, and sprays often enough to keep the foliage covered. In wet years he continues spraying until well into September. He uses extreme care in preparing the Bordeaux and tests each mixture for the amount of precipitation. At the beginning he uses 200 pounds pressure, and when the plants fill the rows it is increased to 350 pounds. While there was a common late blight infection in Aroostook County last year, his potatoes came through with flying colors.

"All of the foregoing factors are vitally important to a successful potato production program. One is no more important than the other. Each must be performed on a timely and efficient basis," says Mr. Shaw.

Fertilizers For Better Asparagus

By Robert E. Young
Agricultural Experiment Station, Waltham, Massachusetts

ASPARAGUS is a long-time crop, and if it is to pay the grower for his effort, particular attention must be given to selection of the proper fertilizer. Being a perennial, it cannot be changed each year from field to field to receive the benefits of crop rotation and cover crops or other organic matter that have been turned under.

Experimental work with asparagus, in which fertilizer and manure were considered, has not been undertaken at many experiment stations. This is due in part to the difficulty of obtaining comparable results from the replicates. It is practically impossible to obtain a perfect stand, and of course once the experiment is started it cannot be changed. Most of the information which is to follow has been derived from experiments conducted in Massachusetts, particularly those carried on by the Waltham Field Station in recent years. Consideration is also given to the results of other experiments, such as those conducted in Michigan, Maryland, New Jersey, and California.

Before discussing the actual selec-

Harvesting asparagus. The young bed on the left should not be cut for at least 2 years after setting.

tion of fertilizer it might be of value to consider the merits of organic matter for asparagus. As a rule the asparagus that is produced in the eastern part of the United States is grown in light sandy soil. Asparagus seems to make better growth in such soils than when grown on good loam. It would seem from this that organic matter such as a loam soil would contain is harmful rather than helpful to asparagus.

A good plant showing the necessity of being careful in cutting the stalks. With the buds coming so close together many are injured by the knife of a careless cutter.

Use of Organic Matter

The results of experimental work lack unanimity concerning the use of manure or other organic matter. In most experiments where manure has been supplemented with commercial fertilizer, the yields have been far superior to those obtained where fertilizer alone was used. Even on a good loam soil the application of manure greatly increased the yield of that particular plot at Waltham. On a coarse sandy soil the effect of seaweed as an organic material was particularly outstanding in getting the asparagus started and producing high yields early in the life of the plants. From the practical standpoint it is questionable if a grower could afford to use manure on his asparagus bed if he has to compete with general market gardeners in purchasing that manure.

The land for new asparagus beds should be well built up with cover crops or other forms of organic matter before setting the roots. When the tops of the asparagus plants are worked into the soil they supply considerable organic matter, and if every 3 or 4 years a light application of manure or other organic matter could be made this would, no doubt, prolong the life of the bed and increase the production with less damage to the plants in times of drought.

The nitrogen in the fertilizer has been shown by experiments to be important for asparagus, particularly on light sandy soils. The form of nitrogen seems to affect the yield slightly, the organic form of nitrogen producing the largest yields but not a sufficient increase over the nitrate form to pay for the added cost of the organics. The nitrate form has given slight increases over the ammonia form in some experiments. On sandy soils and experiments in sand culture the difference has been distinctly in favor of the nitrate. No doubt the acidity of the soil is an important factor in determining the effect of the ammonia form of nitrogen on yields. In a series of experimental plots that were conducted on a coarse sandy soil which received no lime during the experiment, most of the plants receiving sulphate of ammonia were dead

by the sixth year, while the plants receiving nitrate of soda were almost equal to the plants that were kept limed to above pH 6. Where the asparagus was grown on a good loam soil, the sulphate of ammonia plots were slightly better than nitrate of soda.

Calcium cyanamid has been used by many asparagus growers, not only as a source of nitrogen and lime but as a means of controlling the small weeds during the cutting season. Probably the best method in controlling weeds is to use 300 to 350 pounds per acre applied in a band 18 inches wide over the row at the time the first crop of weeds is 2 inches high. A similar application is made at the time the second crop of weeds is 2 inches high. This application will supply all the nitrogen necessary for good growth. A complete fertilizer cannot be used, so superphosphate and potash must be applied to make a balanced fertilizer.

How Much Plant Food?

The amount of nitrogen that can be profitably used depends to some extent on the type of soil, general level of plant growth, and the relationship to the other plant-food elements, particularly potash. The recommendations vary from 60 to 160 pounds of actual nitrogen per acre. If manure or other organic matter is used, or the crop is grown on a good loam soil, the smaller figure is probably nearer correct, whereas if the crop is grown on a sandy soil, poor in organic matter, a larger amount will be necessary for large yields. The proper time of application will be discussed later.

The form of phosphorus used for asparagus has not been the object of very many experiments, probably because superphosphate is the one generally used. The value of phosphorus for asparagus has been questioned by many growers who claim that it causes the tips to spread prematurely. In all the experiments conducted in Massachusetts an ample supply of phosphorus increased the yield, and in recent experiments where a careful check was made there was no difference in the spreading of the tips on the plots receiving no phosphorus and those receiving a generous supply.

Potash Increases Yield

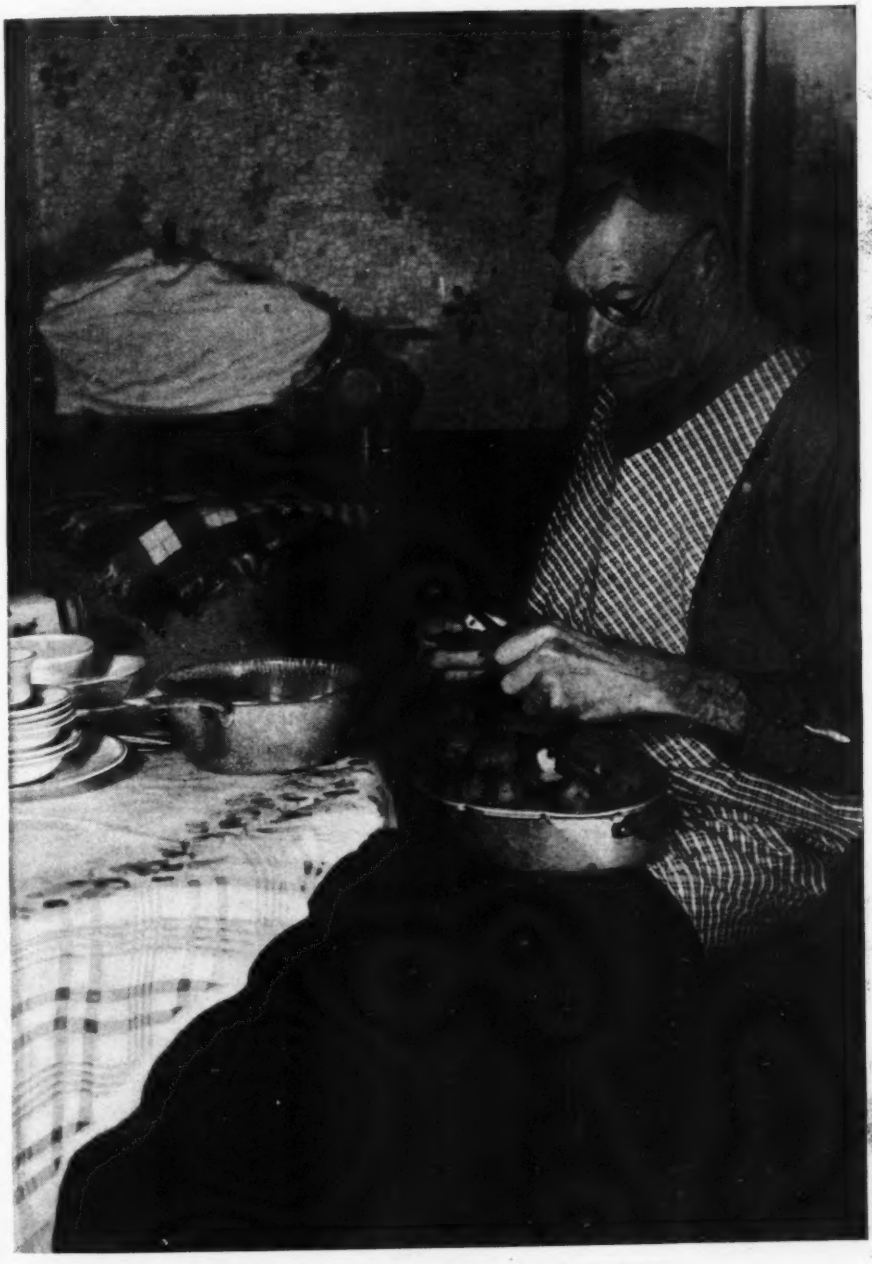
In all the experiments mentioned before, greater response to potash has been obtained than for either nitrogen or phosphorus. These experiments indicate that potash is the most important fertilizer material for asparagus. The results of recent experiments show that the yields of asparagus were increased with each increase up to 360 pounds of actual potash per acre, which would be 720 pounds of 50 per cent muriate of potash. Of course, it is questionable if the larger amounts of potash can be used economically. It has been found that where the larger amounts of potash were used the yields could be further increased by applying a larger amount of nitrogen, thus pointing to a nitrogen-potash relationship. On a coarse sandy soil when potash was omitted from the fertilizer the yields were very low. If only a small amount of money can be spent for fertilizer, it is probable that most of this should go for potash.

The kind of potash to use seems to be of major importance, with experimental data showing the muriate form to be the best and not much difference between the nitrate and sulphate forms. The extra value of the muriate form of potash may be due to the sodium chloride or salt it contains, although salt when applied direct has failed to show such differences in yield as those among the three forms of potash.

There seems to be considerable variation in the results of experiments designed to determine the proper time for applying fertilizer. Considering all the data, it does not seem to make much difference when the fertilizer is

(*Turn to page* 36)

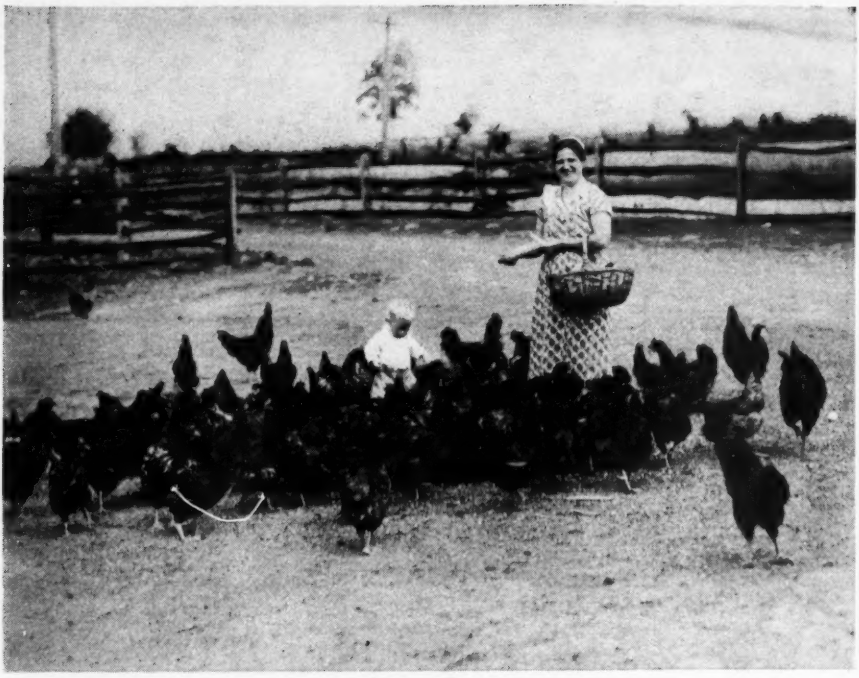
PICTORIAL



GRIM NECESSITY DEVELOPS HIDDEN TALENT.

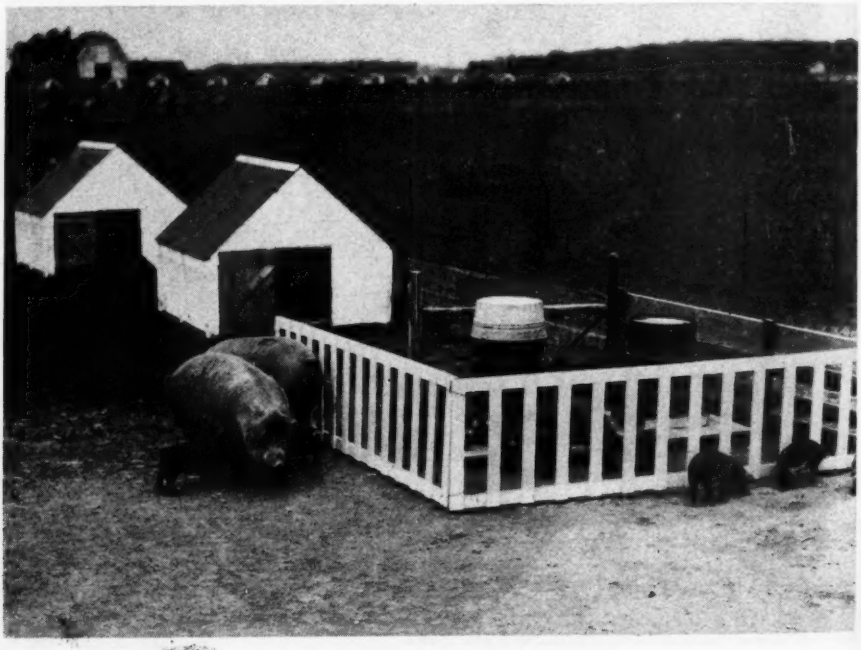
Saturday shopping and community entertainment—diversions from arduous spring work.

Spring comes to the countryside—even farm markets take on a festive appearance.



Poultry is a year-round source of cash income for the farm wife.

Pigs started off in such surroundings will soon make hogs of themselves.



The Editors Talk

Keeping Up With Soils

A new edition of "The Nature and Properties of Soils," by T. L. Lyon and H. O. Buckman, has just appeared. This book can be considered as the latest of a long series beginning with "The Principles of Soil Management," by T. L. Lyon and E. O. Fippin, in 1909. This was followed by "Soils, Their Properties and Management," by T. L. Lyon, E. O. Fippin, and H. O. Buckman, and later by "The Nature and Properties of Soils," by T. L. Lyon and H. O. Buckman. The appearance of the third edition of this book this year thus comes more than a quarter of a century after the first book of the series. It is interesting to observe the changes that have taken place in the subject matter of the books during that time. Subjects which formerly took up whole chapters have now been relegated to footnotes, while other material now occupying major positions, formerly was not mentioned. Methods of mechanical analysis, formerly taking up 11 pages, are now given in a footnote, but a discussion of rapid soil tests is introduced in the last edition.

In the earlier books much attention was given to soil minerals, and the geological concept of soils and their formation. Now comparatively little attention is paid to this, following the divorce of geology and soils. It might be said that the decree was absolute, since the word geology is rare indeed in the latest edition. From the classification standpoint, soils are grouped on the basis of a scheme worked out by Glinka and other Russian workers, and adapted to this country by Dr. Marbut. In place of the geological concept of the soil is the dynamic concept. The soil is considered as a living rather than an inert body.

Stress is now laid on those factors in soil management that can be modified in a practical way by man. For example, soil temperature, while of great practical importance, is primarily of academic interest, since it is difficult to modify it on a field basis. This subject formerly was allotted a full chapter, later was eliminated as a separate subject, but now is given three pages. It is significant that little work is now done on the subject, and the authors refer the reader to an earlier book for a full discussion on it. The soil air formerly was considered of sufficient importance to warrant a chapter. Now it is specifically given one page.

On the other hand, new terms and subjects have been introduced. In addition to the new system on soil classification mentioned above, these include the newer concepts of ionic interchange, carbon-nitrogen ratio, pH in connection with soil acidity and alkalinity, trace elements as fertilizers, artificial farm manure, and rapid tests for determining available nutrients in soils.

This series of books gives an indication of how soil science has changed over the last quarter of a century. The fact that the books reflected this change so well undoubtedly is largely responsible for their continued popularity and prestige in their field.

Safeguards for Our Agriculture

The early reports of county and State agricultural extension workers on the 4-H club work of 1936 indicate that for the first time in the history of the project the enrollment passed the million mark. The membership exceeds that of 1935 by almost 150,000 boys and girls and may reach a total of 1,130,000.

Recognized, without question, as one of the greatest assets for bettering our agriculture, the 4-H clubs are drawing their members from an increasing number of rural homes in the 48 States, Alaska, Hawaii, and Puerto Rico. These members are banded together in small local clubs under the guidance of more than 100,000 trained volunteer local leaders. The only enrollment requirement is an interest in agriculture and homemaking.

The majority of the girls are engaged in one or a number of projects taken from the actual experiences of the farm homemaker. The boys are interested in such projects as may prepare them to be better farmers with a clearer understanding of the problems of rural life. These boys and girls also take an active interest in community affairs, conservation developments, and improved practices in agriculture and homemaking. In developing their projects they follow the most recent recommendations of State and Federal research agencies. In this way they aid in the demonstration and dissemination of the value of practical applications of such knowledge.

It is not to be expected that all of these young people in later life will seek agricultural pursuits, yet through those who will not the industry has further widened the scope of understanding and sympathy with its problems. And the problems of our agriculture are the problems of our civilization.

Progress Requires Fertilizer Usage

The story of farms abandoned when the fertility wore out is an old one. But when the "fertile" frontiers in this country had been pushed to the Pacific Ocean, interest in the fertilizer frontiers began. In other words, fertilizer usage has pretty largely followed the age and intensity of our farming communities, and new indications that eventually this country will know no fertilizer frontiers are coming to light.

H. H. Krusekopf, Professor of Soils, Missouri College of Agriculture, in a recent news release states that the agriculture of Missouri has reached the stage of development where further progress will depend primarily on the adoption of regular soil improvement practices. This means that more fertilizer, limestone, inoculation, terraces, and legumes will be used where they have not been used before, and their use will become a part of the regular farm practice.

"More and more crop production will be done with greater fixed charges and with greater labor requirements," he says. "This trend is clearly indicated with grass. There was a time when seeding only was necessary to secure a stand of grass or clover. Now the majority of land requires special treatment such as liming, fertilization, or inoculation for legumes and even for pasture grasses. The use of fertilizer is a regular practice in many parts of the State. In general, the extensive use of fertilizer is correlated with certain soil conditions."

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

The annual "Preliminary Report of Certain Variety, Fertilizer, and Other Tests Conducted by the Crops and Soils Department of the Louisiana Experiment Station—1936" contains a great deal of useful data as a result of the experimental work of this station. Director C. T. Dowell and his coworkers are to be congratulated for giving out the timely information gathered from the work at the Main and Branch Stations, and also from the cooperative outfield tests carried out in a number of parishes throughout the state. Among the chief findings comprising a large part of this report is the profitable use of fertilizers most adapted for cotton on the various soils. Except for the Red River and Delta soils which require nitrogen fertilizers principally, the high-grade complete fertilizers proved most profitable on the majority of soils in Louisiana. Such analyses as 5-8-4, 5-8-8, 6-8-4, 5-12-8, and 8-8-8 were shown to produce most profitable cotton yields. The rate of application usually recommended is 400-600 pounds per acre. The report emphasizes that much greater gains from increased fertilizer applications may be obtained if boll weevils are controlled. In dry seasons more potash applied to cotton will result in increased profits, especially for soils where cotton rust is prevalent. Under such conditions as are encountered on the prairie type soils west of the Washington Ridge, the use of 600 pounds of a 6-8-8 per acre is recommended. Results of a winter cover crop experiment on bench land at Baton Rouge indicated that it is unnecessary to plow under cover crops each year to maintain high cotton yields; increased cotton yields are reported for 2 or 3 years following turning under leguminous crops. The net profit realized from turning under various winter crops appears to be determined largely by the amount of green matter turned under. Other pertinent information given in this report includes the performance of soybean, oat, corn, and sugar-cane varieties, and seed treatment to control diseases.

"Influence of Rotation and Manure on the Nitrogen, Phosphorus, and Carbon of the Soil," Agr. Exp. Sta., Logan, Utah, Bul. 274, Oct. 1936, J. E. Greaves and C. T. Hirst.

Soils

V. E. Spencer, of the Soils Department, Nevada Agricultural Experiment Station, is stressing the great need for the inauguration of a suitable State-wide study of Nevada's soils in Bulletin 144, entitled "Nevada Soils: An Outline of Proposed Investigations." Of much concern to the farmers in this state is the fact that soil improvement measures are inevitable in order to restore the crop-producing power already lost from the soil and reflected by reduced yields. The author tells us that the progressive farmers are already deeply interested in the problems that have begun to show up in the crops produced on some of Nevada's soils, once believed "such fertile land that its richness is

inexhaustible." Not only are crop yields declining, but the quality of crops produced on soils which are nutritionally deficient is also commanding an early and whole-hearted attention.

The initial step in the author's outline of proposed investigations looking toward the betterment of agriculture is a useful soil survey to serve as a guide to other investigations which are in part based upon it. The next logical step is the establishment of field experiments at strategic locations to furnish a foundation of information necessary in practical soil improvement. The laboratory and greenhouse investigations in connection with both soil survey and field experiments are indispensable tools to furnish information valuable in assisting the field work. The value of soil testing in the extension work is explained as another urgent measure in the soils investigation program.

Since there is growing interest in soil fertility and an increasing tendency toward the use of commercial fertilizer in Nevada, Professor Spencer is firm in his belief that an adequate state fertilizer law requiring that materials sold as fertilizers shall come up to a definite standard is necessary. This law should provide for laboratory fertilizer control work where proper analyses of materials sold as fertilizers can be determined.

The Agricultural Adjustment Administration, U. S. D. A., has recently issued a number of Regional Informational Series Leaflets outlining the 1937 Conservation Program for several agricultural regions. These publications will aid those particularly interested in the provisions for participating in the program. In the East Central Region, the leaflets are termed, "Better Balanced Farming . . .," ECR Leaflet 101 for Delaware, Kentucky, Maryland, North Carolina, Tennessee, Virginia, and West Virginia (a separate leaflet for each state). The Northeast Region Conservation Program is contained in NER Leaflet 102, . . . "Ways to Conserve Soil and Qualify for Payments . . ." The States represented by the leaflets received are New Hampshire, New Jersey, and Vermont. The North Central Region Program is given in NCR Leaflet 103. Only one publication for this region has been received—"Agricultural Conservation — 1937 — for Nebraska and South Dakota." Programs for other regions and states are likely to be released in the near future. In general, farmers in the different sections of the country who plan to participate in the Agricultural Conservation Program will need the information contained in these leaflets, as they give facts about the most important provisions of the program, their application to individual farms, and a list of approved soil-building practices and rates of payment.

"The Nitrate Nitrogen in the Soil as Influenced by the Crop and the Soil Treatments," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 250, Feb. 1937, W. A. Albrecht.

"Lysimeter Experiments—IV, Records for Tanks 17 to 20 During the Years 1922 to 1933, and for Tanks 13 to 15 During the Years 1913 to 1928," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 194, Sept. 1936, T. L. Lyon and J. A. Bizzell.

"Soil Productivity Balance," Agr. Ext. Serv., Columbus, Ohio.

"Land Decadence and How to Halt It," Agr. Ext. Serv., Columbus, Ohio.

"Selenium Occurrence in Certain Soils in the United States with a Discussion of Related Topics—Second Report," U. S. D. A., Washington, D. C., Tech. Bul. 530, Dec. 1936, Horace G. Byers.

"Neutralization Curves of the Colloids of Soils Representative of the Great Soil Groups," U. S. D. A., Washington, D. C., Tech. Bul. 542, Nov. 1936, M. S. Anderson and Horace G. Byers.

"Soil Conservation Reconnaissance Survey of the Southern Great Plains Wind-erosion Area," U. S. D. A., Washington, D. C., Tech. Bul. 556, Jan. 1937, Arthur H. Joel.

Crops

According to Georgia Experiment Station Circular 112, "Bunch Grapes in North Georgia," by J. E. Bailey,

grapes are so well adapted to hillside and mountainous sections of northern Georgia that they should be more generally planted for home use and possibly for commercial production. Among the important considerations explained in this interesting and useful circular are the varieties best suited to this section, setting of the plants, pruning, propagation, and cultivating and fertilizing. Results of 5 years experimentation at the Mountain Station located in the heart of the Blue Ridge Mountains have shown that a gently sloping hillside, well-drained and fertile, with a porous subsoil, is desirable for grape growing in north Georgia. Choice of varieties depends upon location and whether grown for home use or market. Bunch grapes are easily propagated from cuttings made during the dormant season. Two-year rooted vines are most desirable for setting. Spacing of grape vines depends upon the amount of space available and fertility of the soil, as well as the system of training to be employed.

A commercial fertilizer high in superphosphate and potash gives best results. An 8-4-6 (PNK) applied at the rate of 600 to 800 pounds per acre gives good results on sloping lands. Frequent shallow cultivation should be given to control weeds.

Grapes are borne on new wood and for this reason it is necessary to prune each year. Training vines on a two-wire trellis is recommended for general practice.

"Partners in Agricultural Progress, Report of the Agricultural Experiment Station from July 1, 1934 to June 30, 1936," Agr. Exp. Sta., Berkeley, Calif., C. B. Hutchison, Director.

"Some Reasons Why Roses Fail," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 499, Jan. 1937, William B. Shippy.

"Sea Island Cotton," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 500, Mar. 1937, W. E. Stokes.

"Sixteenth Annual Report, 1935-1936, of the Georgia Coastal Plain Experiment Station," Agr. Exp. Sta., Tifton, Ga., Bul. 26, Sept. 1936, S. H. Starr, Director.

"Nineteenth Annual Report of the Department of Agriculture—July 1, 1935, to June 30, 1936," St. Dept. of Agr., Springfield, Ill., Walter W. McLaughlin, Director.

"Thirty-sixth Annual Iowa Year Book of Agriculture," Iowa St. Dept. of Agr., Des Moines, Iowa, Ray Murray, Secretary.

"Sweet Potato Production in Louisiana," Agr. Exp., Baton Rouge, La., Bul. 281, Dec. 1936, Julian C. Miller and W. D. Kimbrough.

"Report of Progress for Year Ending June 30, 1936," Agr. Exp. Sta., Orono, Me., Bul. 384, June 1936.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, No. 3, Feb. 1937.

"Sweet Potato Project," Agr. Ext. Serv., State College, Miss.

"Forty-ninth Annual Report, 1936," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y. Carl E. Ladd, Director.

"The Potato Situation and the Status of Potato Research in New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 352, June 1936, H. C. Thompson, M. P. Rasmussen, E. V. Hardenburg, F. M. Blodgett, Donald Reddick, G. F. MacLeod, J. R. Livermore, and Ora Smith.

"Varieties of Vegetables for 1937," Cornell Univ. Ext. Serv., Ithaca, N. Y., Bul. 370, Feb. 1937, Paul Work and A. E. Griffiths.

"The Panhandle Bulletin," Panhandle A. & M. Col., Goodwell, Okla., No. 62, Mar. 1937.

"Forty-ninth Annual Report of the Pennsylvania Agricultural Experiment Station for the Fiscal Year Ended June 30, 1936," Agr. Exp. Sta., State College, Pa., Bul. 336, July 1936.

"Tree Fruit Varieties in North Texas.," Agr. Exp. Sta., College Station, Tex., Bul. 535, Nov. 1936, L. E. Brooks.

"How Science Aids Utah Agriculture—Biennial Report of the Director, 1934-35 and 1935-36," Agr. Exp. Sta., Logan, Utah, Lowry Nelson, Director.

"Forty-sixth Annual Report for the Fiscal Year Ended June 30, 1936," Agr. Exp. Sta., Pullman, Wash., Bul. 342, Dec. 1936, Edw. C. Johnson, Director.

"Home-grown Red Clover Seed Best," Agr. Ext. Serv., Madison, Wis., Cir. 289, Jan. 1937, O. S. Aamodt, E. J. Delwiche, and A. L. Stone.

"Report of Extension Project 22, 1936," Agr. Ext. Serv., Madison, Wis., Dec. 15, 1936, F. V. Burcalow.

"The Houma Potato: A New Variety," U. S. D. A., Washington, D. C., Cir. 420, Dec. 1936, C. F. Clark, F. J. Stevenson, and J. C. Miller.

"List of Publications of the U. S. D. A. from January 1931 to December 1935, Inclusive," U. S. D. A., Washington, D. C., Misc. Pub. 252, Mabel G. Hunt.

Economics

Of special interest to those interested in the economic aspects of the fertilizer industry are the various state tonnage reports which are published about this time of the year. The Bureau of Agricultural Economics, U. S. Department of Agriculture, cooperating with the Alabama Department of Agriculture and Industries, has issued a very complete report of the fertilizers used in Alabama. According to this report, a total of 468,800 tons of fertilizer was sold in Alabama in 1936. From the tonnage standpoint, the most important grade sold in that state last year was 3-8-5 which represented 111,262 tons of the total. The next most important grade was 6-8-4 with 91,193 tons, and third was 4-8-4 with 80,182 tons. These three grades made up about 80 per cent of the total of mixed goods sales. The tabulations were made on the basis of analyses and by counties. The average analysis of mixed goods has increased from 16.5 per cent to 17.2 per cent since 1929.

The Indiana Department of Agriculture also published a very complete report on fertilizer sold in that state. According to the tag sales reports from Indiana, 254,118 tons of fertilizer were sold in 1936, and the report published by the Indiana Department of Agriculture covers 238,390 tons. Of this total, 103,725 tons were sold in the spring, and 134,665 tons in the fall. The most important single analysis in Indiana was 2-12-6, which constituted 107,658 tons of the total. The report covered 118 different analyses of mixed goods.

According to the report of the State of Maryland Inspection and Regulatory Service at College Park, Md., there ware 92 firms registered in Maryland, 857 registered brands, and 93 different analyses. Of the 93 different analyses registered, 61 were complete fertilizers, and 6 were superphosphate and potash mixtures. Total sales in Maryland in 1936 were 164,817 tons. The tonnage of plant food included in mixed fertilizers was as follows: 3,944 tons nitrogen, 12,999 tons phosphoric acid, and 9,096 tons potash. Fifteen brands made up the largest part of the total tonnage, 139,508, with 2-9-5 the most important single analysis.

The Department of Agronomy of the Ohio State University reported that there were 337,146 tons of fertilizer sold in Ohio in 1936, of which 138,370 tons were sold in the spring, and 198,776 tons sold in the fall. This compares to sales of 306,509 tons in 1935, and to 338,662 in 1929. The most important single analysis sold in 1936 was 2-12-6, which constituted 123,111 tons of the total. This report also gives the data by counties. Fertilizer sales in Ohio are fairly well distributed throughout the state.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 20 and 21, Jan. and Feb. 1937.

"An Economic Study of Milk Production Costs in Herds of Producer-Distributors in Maine," Agr. Exp. Sta., Orono, Me., Bul. 385, Aug. 1936, George F. Dow.

"Official Inspections 161—Commercial Fertilizers, 1936," Agr. Exp. Sta., Orono, Me., Oct. 1936, Elmer R. Tobey.

"Commercial Fertilizers, Commercial Feeds, and Agricultural Liming Materials," St. Insp. Serv., Univ. of Md., College Park, Md., Control Series No. 161, Jan. 1937.

"Inspection of Agricultural Lime Products," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 87, Dec. 1936, H. D. Haskins.

"Acquiring Farm Ownership by Payments in Kind—A Plan to Permit Tenants to Buy Farms Through Annual Product Payments," Agr. Exp. Sta., Columbia, Mo., Bul. 378, Jan. 1937, O R. Johnson.

"Types of Farming in Montana—Part I. Physical Environment and Economic Factors Affecting Montana Agriculture," Agr. Exp., Sta., Bozeman, Mont., Bul. 328, Oct. 1936, Neil W. Johnson and M. H. Saunderson.

"Inspection of Fertilizers," Agr. Exp. Sta., Kingston, R. I., Annual Fert. Cir., Sept. 1936, W. L. Adams and T. Wright, Jr.

"Drainage and Irrigation, Soil, Economic, and Social Conditions, Delta Area, Utah," Agr. Exp. Sta., Logan, Utah, Bul. 273, Oct. 1936, W. Preston Thomas and George T. Blanch.

"A Graphic Presentation of Changes in the Agriculture of Washington from 1930 to 1935," Agr. Exp. Sta., Pullman, Wash., Bul. 341, Dec. 1936, Carl P. Heisig.

"Cooperation Principles and Practices," Agr. Ext. Serv., Madison, Wis., Sp. Cir., Nov. 1936, Chris L. Christensen, Asher Hobson, Henry H. Bakken, R. K. Froker, and Marvin A. Schaars.

"Producers' Goals and Consumer Goals," U. S. D. A., Washington, D. C., G-65, Mar. 1937.

"The Nature and Properties of Soils"

The third edition of "The Nature and Properties of Soils" (The Macmillan Company, New York, $3.50) has been prepared by the indefatigable T. Lyttleton Lyon and Harry O. Buckman of Cornell University. To those who have studied soils the title and authors need no introduction. The general style, arrangement, and scope of the book are similar to the preceding edition. The authors have been conscientious in their revision, however, and the text has been largely rewritten. Keeping pace with the progress of soil science, appropriate newer developments have been introduced into this edition.

The first half of the book is devoted to the physical and chemical properties of soils, while the latter half gives consideration to the fertility relationships of soils. The book opens with a general introduction to the concept that the soil is a dynamic body with definite characteristics, rather than just dirt. Following this are chapters devoted to the consideration of the soil as a medium for supplying plants with the nutrients needed for growth; soil colloids and ionic interchange; the microbiological population of the soil; soil organic matter; soil moisture and its control; origin and modes of formation of soils; classification of soils; peat and muck soils; soil acidity and alkalinity; liming; soil nitrogen in its various relationships; a brief discussion on fertilizers and their use; farm and green manures; and methods of maintaining the fertility of soils.

The sequence of chapters in a book, of greater importance in a textbook than in a reference book, is frequently a trying problem, the solution usually representing a compromise not wholly satisfying. The present edition marks some notable improvements in the matter of chapter sequence over earlier editions, in the opinion of this reviewer. Placing the chapter devoted to fertility maintenance at the end rather than near the beginning of the book certainly appears more logical. While some may say that this chapter, representing the motivating spirit of the book, should be introduced earlier, the problems involved are so complex that all the information contained in this or any other book is little enough for solving them. It would seem that the chapters on soil moisture could well precede the consideration of ionic absorption and exchange, and since farm and green manures are so closely related to the soil organic matter, these chapters could well be closer together in the book.

Recent Developments

Out of the great mass of literature on soil science, the authors appear in the main to have culled wisely and digested carefully, with emphasis given to more recent developments. A fuller discussion of soil classification according to the pedological system worked out for this country by the late Dr. Marbut is given. The material on colloids and ionic exchange has been expanded in this edition to in-

clude modern concepts. This would seem to be warranted by the great importance of these phenomena in practically all soil relationships. The significance of trace elements in fertilizers and soils and the use of rapid tests in the determination of the fertilizer needs of the soil are briefly discussed. The authors wisely point out the possible futility or even danger of placing such tests "in the hands of amateurs" (p. 358). However, it seems to this reviewer that a little more emphasis could have been given to the proven value of these tests when placed in the hands "of experienced and technically trained men who understand the scientific principles underlying the common field procedures" and the correlation with soil characteristics and plant responses that have already been effected. In considering fertilizer placement, full advantage does not appear to have been taken of the results of work in this field within the last several years.

"The Nature and Properties of Soils" will serve as an excellent reference book to those having to deal with soils, and who in agriculture does not, some time or other? The concise and lucid handling of the various subjects, combined with a full subject index and the restoration of the author index, enhances its value for this purpose. However, the book is primarily a textbook, the latest of a series by the same authors which has been the standard for the teaching of soils in this country for many years. The authors have rendered an inestimable service to soil science in standardizing on a high plane the fundamental training in the subject, so that the confusion commonly attendant on the development of a new science, such as that of soils, has been largely lacking here. The third edition is fully up to the standard of the previous editions and there is every reason to believe that it will enjoy the same well-merited success.

"Production of Field Crops"

The well-known book on agronomy, "Production of Field Crops," by T. B. Hutcheson and T. K. Wolfe, has been revised, with the addition of a new co-author, M. S. Kipps, all of the Virginia Agricultural Experiment Station (McGraw-Hill Book Company, Inc., New York, $3.50). This new edition follows the same general form as before, with some rearrangement of chapter and subject sequence, condensation of numerous subjects, inclusion of new material, and the addition of references at the end of each chapter.

The book is divided into nine sections entitled General, Cereal or Grain Crops, Legumes for Seed, Forage Crops, Root Crops, Fiber Crops, Tubers, Sugar Plants, and Stimulants, respectively. The first chapter is a general historical introduction to plant culture, which is followed by chapters devoted to a discussion of the economics of crop productions; the adaptation of crops to various factors; the classification of field crops from the botanical and agronomic viewpoints; germination and growth of seeds and plants; plant breeding and hybridization; the value and use of good seed; a very brief consideration of the use of commercial fertilizers; barnyard manure; lime; seedbed preparation; seeding practices; tillage; harvesting grain crops; haymaking; silage; pasture and meadow management; weeds; and crop rotation. The rest of the book is devoted to the individual crops, giving in each case the

botanical classification, production data, historical facts, varieties, uses, specific cultural practices, insect pests and diseases and their control. These chapters include cereals, corn, wheat, oats, barley, rye, buckwheat, rice, peanuts, soybeans, cowpeas, field peas, field beans, pasture and hay grasses, clovers, alfalfa, sorghums, millets, vetches, rape and sunflowers, sweet potatoes, carrots, mangels, turnips, cotton, flax, hemp, potatoes, sugar beets, sugar cane, and tobacco.

The expansion of the chapter on germination and growth of seeds and plants to include brief descriptions of cell structure in the root and leaf will be very helpful to those of us who have become a little rusty in our botany. A new section on vernalization, or iarovization, briefly explains these terms, newcomers to crop literature within the last several years. When discussing plant breeding and hyoridization, a section on the Jones method of breeding corn has been added.

The rearrangement of the subject matter in the second edition of "Production of Field Crops" represents a distinct improvement, especially from the viewpoint of a textbook. The first edition served as a handy reference book, and this edition should prove even more useful owing to the inclusion of new material and the lists of references following each chapter.

Fertilize Corn Properly For Early Spring Growth

THAT quick growth of stalks so necessary for the formation of early ears of sweet corn depends to a great extent upon proper fertilization. C. H. Nissley, extension professor of vegetable gardening at the New Jersey College of Agriculture, Rutgers University, says that placing fertilizer so that the roots of the plants have ready access to it early in the spring is important in fertilizing this crop.

"The analysis of commercial fertilizer used by most New Jersey sweet corn growers ranges from a 6-6-5 formula to a 5-8-7 or a 4-12-6," Mr. Nissley reports. "Where a rye or other green manure crop is plowed under, a fertilizer containing a larger amount of nitrogen is advisable, and where stable manure has been applied, fertilizer containing a greater amount of phosphorus is recommended. The most popular fertilizer, however, is the 5-8-6 or 5-8-7 commercial mixture.

"At least half of the fertilizer should go deep into the ground in the row. It is best applied with a potato planter or with a fertilizer distributor which places the fertilizer in bands 3 to 4 inches in the ground and 2 inches away from the seed. This method locates the fertilizer in fairly moist soil and where it will be more readily available for plant use should dry weather follow seeding. From 600 to 800 pounds of fertilizer per acre are usually applied in the row.

"After the corn has attained a height of about 12 to 15 inches, apply 600 to 800 pounds of the same fertilizer to each acre as a side-dressing and cultivate it into the ground along the row. About the time the sweet corn comes into tassel some growers find it advisable to apply a nitrogen fertilizer at the rate of 150 to 300 pounds to the acre. The application of the nitrogen fertilizer at this time

under normal growing conditions will produce a green-colored husk and increase the length of the streamer on the ear.

"Do not cultivate sweet corn deeply after the corn has attained a size of at least 18 to 24 inches. Deep cultivation will tear off many of the feeding roots which are so important to the early spring crop."

Fertilizers For Better Asparagus

(*From page* 22)

applied as long as the application is not delayed beyond the time of the last cutting.

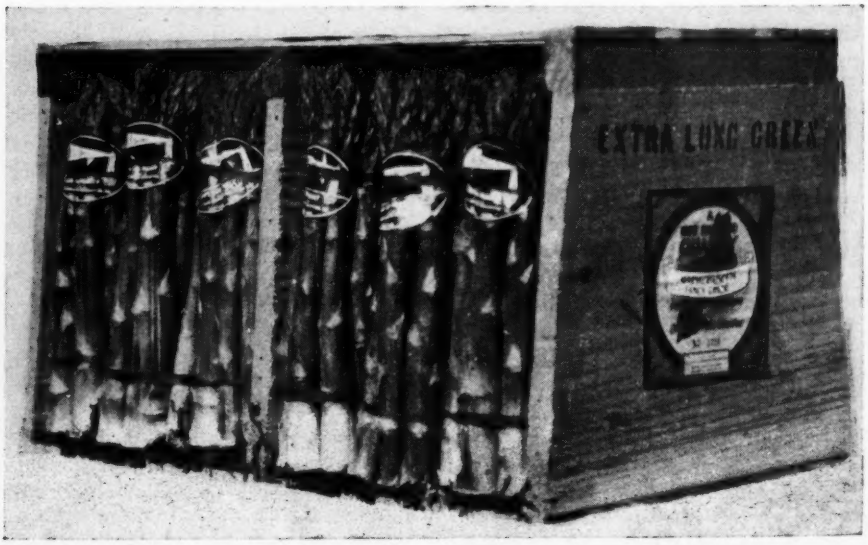
The result of one experiment conducted in Massachusetts indicated that it was slightly better to apply the phosphorus early in the spring before the cutting season. It is probable that this early application permits the phosphorus to be more thoroughly worked into the soil by the cultivations made during the cutting season. Where mixed fertilizers are to be applied it is questionable how many growers would care to divide this application, thus making double the work. If fertilizer materials are to be used it is probably best to apply the superphosphate and potash before the asparagus bed is prepared in the spring, thus affording ample opportunity to work these materials well into the soil. The application of nitrogen fertilizer can then be divided as the grower desires. All of the fertilizer should be applied to the bed by the end of the cutting season.

RECOMMENDATIONS

Sandy Soil

Where good growth is obtained use one of the following:

1. Apply 1,500 to 2,000 pounds of an 8-10-12 or similar analysis fertilizer



Careful packing is as important as careful growing, in marketing asparagus with a profit.

per acre, apportioning the quantity if desired, applying two-thirds of the fertilizer before the cutting season. If no such analysis as 8-10-12, 4-5-6, or 5-8-10 fertilizer is available, use 5-8-7 and apply 200 pounds of muriate of potash or nitrate of potash in addition.

2. Apply 1,200 pounds superphosphate and 400 to 500 pounds of muriate of potash per acre before preparation of the bed in the spring. Top-dress with 125 to 160 pounds of actual nitrogen per acre, using either 600 to 800 pounds of cyanamid or 800 to 1,000 pounds of nitrate of soda. If cyanamid is used, apply in two equal parts, the first at the time the first weed crop is 2 inches high. The fertilizer should be used over the row only, a band 18 inches wide being sufficient. This application will control most weeds for about 2 weeks. The second application should be made at the time the next crop of weeds reaches 1 to 2 inches in height. If nitrate of soda is used to supply the nitrogen, one-half should be applied before and the remainder at the conclusion of the cutting season.

Loam Soils

Where asparagus is grown on good loam soil, the fertilizer may be reduced one-quarter and the nitrogen portion as much as one-third.

Poor Sandy Soils

Where soil and other factors affecting growth are limiting the production of asparagus to a light crop, it would not be economical to make such heavy applications of fertilizer although ample quantities should be supplied to restore production to normal.

Young Asparagus Beds

Apply three-quarters as much as recommended under No. 1 for the first 2 years, then regular amounts thereafter.

Results With Potash in Eastern Virginia

(*From page* 12)

was well supplied with calcium, magnesium, etc. This time a 6-6-0 mixture yielded 160 bushels to the acre while the 6-6-5 mixture yielded 180 bushels or 12 per cent increase in yield. The 6-6-10 mixture also yielded 180 bushels to the acre or no increase in yield over the 6-6-5 mixture. The rainfall was slightly below normal and the yield possibly a little below average. Since a 6-6-5 mixture gave only a 12 per cent increase in yield over the 6-6-0 it is not likely that a 6-6-10 mixture could have been profitable under even the most ideal conditions.

The response to potash in the fertilizer was very low on the soil well supplied with potassium. There was no response to phosphorus in the fertilizer used on this soil. The profitable application of fertilizer for this soil would have been an average application of nitrogen and potash, without phosphorus, for the conditions under which the crop was grown.

The results with peas are of limited value due to a dry season. For a field that showed a fair level of potash, no response to this element in the fertilizer was noted, whereas nominal response was noted on a field that had a low level of potash. Whether a "fair" amount of potash in a soil indicates a sufficient quantity for the production of peas is a question yet to be answered. It is certain, however, that a crop will respond to potash where the supply in the soil is low. These results are given in table 3.

Again the number of tests on soils low in potash was limited. Beets are

TABLE 3—Test with Peas on Soil "Fair" in Available Potash, Norfolk Fine Sandy Loam

Fertilizer*	Pounds per Acre
6-6-0	5,346
6-6-5	5,135
6-6-10	5,188

*1,000 pounds to the acre. Top-dressed with 200 pounds of calnitro.

considered a crop that requires a large amount of potash. On a soil that showed a fair level of potash the 6-6-5 mixture gave a 15 per cent increase in yield over the 6-6-0 plat, table 4, and 22 per cent increase for the 6-6-10 plat. Here again the yield was below the average due to limited rainfall. Several factors of importance were noted in the beet crop. The beets receiving the potash made a more rapid start and matured several days earlier. Since weather conditions were not conducive to rapid growth it is likely that the difference should have been more pronounced had the season been normal. But a low response to potash was about all that could be expected where the potash content of the soil was fairly high. Two hundred twenty-six pounds to the acre of replaceable potash were present in this soil.

TABLE 4—Test with Beets on Soil "Fair" in Available Potash, Moyock Fine Sandy Loam

Fertilizer*	Pounds per Acre	Per Cent Increase
6-6-0	6,583	..
6-6-5	7,584	15
6-6-10	8,033	22

*2,000 pounds to the acre.

The results with sweet potatoes might be called outstanding. One of the growers, who produces rather large crops of sweet potatoes after leafy vegetables, has experienced difficulty in getting a good yield of high quality potatoes. It was thought that since he used 6-6-5 and 9-5-4 fertilizer mixtures with additional nitrogen on his leafy vegetable crop, he was likely to already have too much phosphorus and nitrogen in his soil for sweet potatoes. It was decided to try an experiment using 3-3-15, 0-0-15, and 0-0-30 mixtures as compared with no fertilizer treatment. This test was laid out and the above fertilizers were applied at the rate of 1,000 pounds to the acre. All of the crop made rank growth of vines, too rank in fact. The yields of U. S. No. 1 potatoes, figure 3, were 242 bushels to the acre for the no-fertilizer plats, 228 bushels for the 3-3-15 plats, 230 for the 0-0-15 plats, and 327 for the 0-0-30 plats. In other words, 300 pounds of muriate of potash gave no response, but 600 pounds gave 85 bushels to the acre increase.

Balanced Nutrient Supply

It is probable that a larger supply of potash would have given even a larger increase in yield on this field. The explanation of this large increase in yield for the 600 over the 300-pound application perhaps lies in the fact that the nutrient supply was brought into balance only when the potash was built up to a definite point. The soil test showed a "high" ammonia and nitrate content, "fair plus" test for phosphorus, "low fair" test for potash, and a "good" test for calcium. In other words, the nutrient supply of the soil was completely out of balance for the production of sweet potatoes. This has often been found to be the case with a variety of crops. It has been found quite frequently that more than an average application of the nutrient concerned was necessary to produce the maximum crop yield.

It has been shown that when the proper coincidence of chemical factors occurs in the soil and climatic conditions are favorable, abundant crop production is a result. Without a knowledge of the available nutrients present, optimum nutrient conditions in the soil occur only as a matter of

chance. If the soil test is made, a limiting factor in crop production may be eliminated.

It is realized that all of the conditions in the soil which may influence the soil test have not been learned. It has been shown that much work needs to be done on various soil types and with the various crops. It has further been shown that the potash requirements of the various crops need considerable study. However, it is believed that a working basis for the various crops has been started that warrants further study.

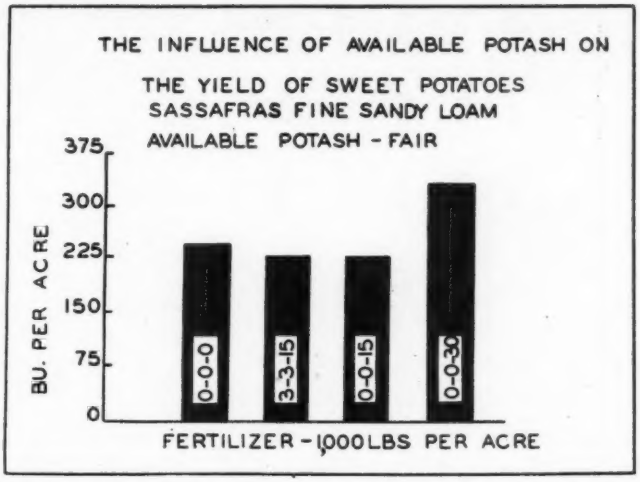


Fig. 5—The soil carried an excess of calcium, nitrogen, and phosphorus for sweet potatoes.

Feeding Cattle Minerals Through Better Pastures

(*From page* 8)

the returns per acre. The 2-12-10 fertilized plot grazed six head equally as well as the other two plots carried four head for the season and with increased individual gains above the other groups. As there is usually a

TABLE III—COMPARISON OF THE EFFECTS OF:
1. A pasture well-fertilized with a 2-12-10 analysis and salt.
2. Bone meal and salt in the trough.
3. Salt alone.

Conducted on the Farm of E. Ackert, Holyrood, Ontario, 1936.
(In co-operation with the Departments of Chemistry and Animal Husbandry, Ontario Agricultural College, Guelph).

	Plot 1*	Plot 2**	Plot 3
Size of plot	12 acres	12 acres	12 acres
No. of cattle grazed	6	4	4
No. per 100 acres	50	32	32
Average wt. May 10, 1936	945 lbs.	975 lbs.	925 lbs.
Average wt. Oct. 21, 1936	1,263 "	1,270 "	1,215 "
Average gain per head	318 "	295 "	290 "
Total value May 10, 1936 @ 4c	$226.80	$156.00	$148.00
Total value Oct. 20, 1936 @ 6c	$454.68	$304.80	$291.60
Gross increase	$227.88	$148.80	$143.60
Cost of treatment	$ 30.00	$ 2.00	$ .....
Net gain	$197.88	$146.80	$143.60
Returns per acre	$ 16.57	$ 12.40	$ 11.13

*Plot 1—Charged with ½ cost of 300 lbs. of 2-12-10 fertilizer applied broadcast in the early spring.
**Plot 2—Charged with 66 lbs. of bone meal.

TABLE IV—SHIPPING AND SLAUGHTER SUMMARY OF MINERAL FEEDING AND FERTILIZER EXPERIMENT OF BEEF CATTLE ON PASTURE 1936

Plot No.	Treatment	Av. wt. May 10	Av. wt. Oct. 20	Av. gain on grass lbs.	Av. gain on grass pct.	Av. wt. Oct. 20 (Buying)	Av. wt. Oct. 22 (Killing)	Av. shipping shrinkage lbs.	Av. shipping shrinkage pct.	Av. warm dressed weight lbs.	Av. warm dressed weight pct.	Ave. cold dressed weight lbs.	Ave. cold dressed weight pct.
(1)	300 lbs. 2-12-10 + salt..... 6 head.	945	1,263	318	33.65	1,263	1,215	48	3.78	696	55.10	684	54.11
(2)	66 lbs. bonemeal + salt..... 4 head.	975	1,270	295	32.82	1,270	1,207	63	4.96	694	54.64	682	53.74
(3)	Salt alone ..... 4 head.	925	1,215	290	31.35	1,215	1,160	55	4.52	656	53.99	643.5	52.96
Plot 3 less animal No. 35..... (Extra good breeding)		....	1,237	....	....	1,237	1,173	64	•5.17	654	52.87	641	51.85

residual effect of the fertilizer on pastures, it was thought only fair to charge one-half of the cost of treatment to the cattle. After deducting this amount, the increased financial gain for the 2-12-10 per acre was $5.44 above the salt plot and $4.17 above the bone meal.

As in the previous season, the cattle receiving the bone meal supplement and those on the 2-12-10 fertilized pasture had a decidedly more thrifty appearance than the salt group.

To complete the picture of this work and determine if the various treatments had any effect on the quality of the cattle, arrangements were made to slaughter them at a local abattoir. The cattle were shipped in two trucks a distance of 85 miles, yarded for two days and fed hay and water. Individual weights were taken just before shipping and again just before slaughtering. Warm-dressed and cold-dressed weights were also recorded. The following table presents the average shipping and slaughter results.

Practical Advantages

The addition of the mineral supplement decreased the shipping shrinkage and increased the dressing per cent over the salt group, which indicates that the natural pasture is not supplying all required by the animal. The group on the fertilized pasture (2-12-10) was decidedly better in shipping and dressing percentage than the other two groups. While no attempt was made to grade the cattle on the hoof, the slaughter tests would indicate that the latter group should sell for a higher price than the salt alone group. It also proves the point of the practical farmer or cattle buyer, that cattle from good soil will make better gains and are worth more per pound than cattle raised on soils low in fertility. The results are also a direct answer, as far as one season can determine, to the value of fertilizers in producing more fodder with an increased nutritional value.

The soil on which this experiment was conducted is a Napanee clay loam, slightly acid in reaction, of good natural drainage, very low in available phosphorus but reasonably high in replaceable potassium. The fields have been in pasture for nearly 20 years and the sward consists chiefly of Canada and Kentucky bluegrasses, timothy, with a small per cent of red top and trefoil.

Samples of the herbage were taken on June 25 from the fertilized and unfertilized area, separated into species, and analyzed for total nitrogen, phosphorus, and calcium, with the following results:

TABLE V.*—COMPOSITION OF PASTURE HERBAGE

	Fertilized Area				Check area			
	Ash %	N %	P %	Ca %	Ash %	N %	P %	Ca %
Alsike	6.99	2.49	.185	1.346	....	....	....	....
Trefoil	6.23	2.56	.181	1.314	5.58	2.44	.147	1.409
Can. blue	8.14	1.19	.153	.336	6.26	1.22	.100	.238
Ky. blue	5.53	1.14	.153	.315	4.36	1.13	.113	.333
Timothy	5.38	.95	.157	.260	5.35	.98	.129	.292
Red Top	7.34	1.06	.171	.310	6.72	1.20	.132	.372

* Figures on moisture-free basis.

These investigations clearly show that a rational fertilization of forage crops can have a beneficial effect, not only directly on the crop yields, but indirectly on the livestock being fed the forage. There is a very definite indication that by improving the fertility of the soil we can improve the cattle.

Growing No. 1 Tomatoes For Hoosier Canners

(*From page* 17)

marker in the middle of the drill, which serves as a mark for the planter, thus the soil is fertilized just ahead of the tomato setter. The plants are then set in the center of the 14-inch fertilizer strip. A corn cultivator with fertilizer attachment is a very satisfactory implement to use after the plants are set and have straightened up.

If machinery is not available for any of the above methods of application, the fertilizer should be placed deep under the rows and thoroughly mixed with the soil before setting the plants. Sometimes a single shovel plow is used to make a furrow, and then a one-horse corn planter with fertilizer attachment is used, drilling the fertilizer back and forth in this furrow until the desired amount has been distributed.

There are two main satisfactory sources of tomato plants—those from southern states and local plants grown in the open or under canvas or glass. Each have their special advantages. Where a grower can raise his own plants, this is usually the cheapest; and it is always good insurance to raise some for transplants.

Varieties: Various improved strains of Baltimore are most satisfactorily used in the state. Stone may be used for the extreme southern portion of the state because of its greater foliage protection for the fruits. Some of the wilt-resistant varieties are Marglobe, and a more recent similar introduction is the Pritchard.

Seed: Good certified seed always should be used. It should have a guaranteed germination and have been produced from good parent stock.

Plant Beds: In growing tomato

plants in cold frames or hotbeds, watering should be done in the morning so that foliage will be dry by night and prevent spread of diseases. The temperature of the beds should not go below 50 or 55° F. at night and ventilation given during the day when the temperature rises above 75-80° F. The plants should be sprayed every week with 2-6-50 Bordeaux or dusted with a 20-80 copper lime dust. Arsenate of lead should be added where insects are eating the plants.

A number of weeds, including ground cherry, nightshade, and horse nettle, carry diseases which also attack tomatoes. For this reason, these, as well as other weeds, must be kept under control, especially around plant beds.

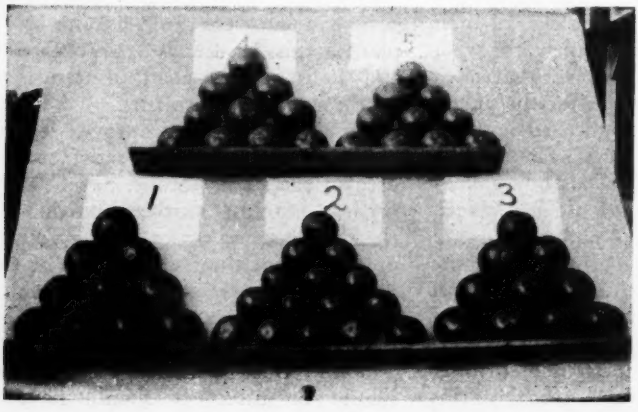
No one should use tobacco while working around plant beds or while transplanting, because the disease of tobacco mosaic also attacks tomatoes. Those who use tobacco should wash their hands with soap before handling plants.

Transplanting retards growth, more or less, depending on the amount of root injury. Plants should be moved with as little shock as possible. Water beds 12 hours before lifting. Do not pull plants, but lift them with a spade or fork with close tines. Leave as much soil on roots as feasible. Roots dipped in a mud paste made from clay and water are better able to withstand the shock of transplanting. Plant setting should be done on cloudy days, or if the weather is extremely hot and clear, only in afternoons, preferably late afternoon.

A good plant to set in the field should not be badly wilted, diseased, or woody, and should have a stem the size of a lead pencil, 6 to 8 inches high with a blossom cluster just forming. Longer plants should be set deep, even in a trench, allowing only a small portion of stem above the surface of soil, as all portions under soil will produce roots.

Plants are usually set 4 feet by 4 feet on very fertile soil, and 3½ by 4 feet on medium soil. Some successful growers have been planting their tomatoes 3½ by 3½ feet. Tomato plants are set both by machine and by hand, and either method may be used successfully by skilled men. Counting a team of horses on the transplanter as one man, there is little difference in the cost of setting an acre. In both methods it is essential that the roots of the tomato plants are firmly pressed into contact with the moist soil.

The plants should be set in the field as soon as the frost danger is past — during the last two weeks in May and the first week in June, depending somewhat upon location in the state. Data from New York State show that



Nos. 1-2-3 tomatoes were taken from plots which received high-potash fertilizer. Nos. 4-5 were fertilized with a 2-12-6. Note the larger fruit and better color produced by the extra potash.

growers planting before June 5 averaged 10 tons per acre; from June 5 to 10, seven tons per acre; and those setting later than June 10 averaged only 4.1 tons per acre. Figures collected in Indiana in 1920 also showed the advantage of early plantings in total yields.

Tomatoes should be cultivated often, but very shallow, to destroy weeds without injuring the roots. The root system of the tomato begins very close to the surface of the soil and may extend down some 2 to 3 feet, however, most of the roots are in the top 8 inches of soil. Corn cultivators equipped with sweeps or duck-foot shovels may be used, as they are very efficient weed-killers and destroy very few feeding roots. Many farmers are using homemade, one-horse, sled-type drags, made by driving 60-penny spikes through planks at 4-inch intervals. The spikes extend 2 inches into the soil. The drag is guided by two handles extending in the rear.

Discontinue the use of any cultivator whenever there is danger of injuring the vines. The destruction of foliage or leaf area reduces the food-manufacturing capacity of the plant and causes lower yields. Good foliage is of great value in warm weather, since it keeps the fruit cooler and thereby enables the plant to produce a greater percentage of No. 1 tomatoes.

In an average tomato season more than 65 per cent of the tomato fruits will become U. S. No. 1's and bring the farmer the "top price," if picked at the right time. At picking time it is essential that the farmer consider ways he may handle his help so that tomatoes will be picked to return him full value. If a normal tomato is picked too green or too ripe, it becomes a No. 2 or cull. A potential No. 1 tomato picked as a cull is a loss, with the additional cost of hauling to the factory. A No. 1 picked as a No. 2 is merely obtaining the cost of production. A No. 1 picked so it will grade a No. 1 means a profit for the grower and a happy contractor. In an effort to help the farmer to pick tomatoes as U. S. No. 1's, there has been published a leaflet on Profits in Tomato Picking which gives the essentials of better picking.

A large tonnage of tomatoes is purchased each year on the basis of Federal state grades. These grades are administered through the U. S. Department of Agriculture and Purdue University Agricultural Experiment Station, and are determined by specially trained inspectors. This is a sound basis on which to buy or sell tomatoes. Some canners purchase their tomatoes on a flat rate basis at a specified price per ton with the privilege of inspection. Indiana canners have had an enviable reputation for the quality of their canned tomatoes and tomato products, and this cannot be maintained without the delivery of red, ripe tomatoes at the factory.

Eight Essentials of Quality Tomato Picking

1. The crop must be grown with good farm practices, but it must also be carefully and skillfully picked.
2. Color-blind people are usually not successful tomato pickers unless they have knowledge of their condition and pick for brightness rather than redness.
3. Frequency of picking must be governed by weather conditions, but tomatoes are usually picked too frequently.
4. On the average, 68 per cent will become U. S. No. 1's and remain as U. S. No. 1's for an average of 6.5 days.
5. Bruised or cracked tomatoes from careless picking, overfilling the baskets, or improper loading of the tomatoes in trucks or wagons result in a loss of tonnage and quality to grower and canner.
6. Tomatoes which are wet from rain

or dew appear redder than when dry. The picking of wet tomatoes should be avoided, but when necessary, special care should be used.

7. More rotten tomatoes result from careless picking than from weather conditions.
8. Most tomato pickers must be supervised and paid on a quality and thoroughness basis.

A Modern Pioneer—J. W. Hadden

(*From page* 13)

phosphate, and 200 lbs. of nitrate of soda per acre to 282 acres, from which he picked 245 bales of staple cotton. And the staple cotton grown on hill land compared favorably with staple produced in the Delta.

Believing that oats would show a corresponding increase if fertilized, Hadden tried 200 lbs. muriate of potash and 100 lbs. of nitrate of soda on 12 acres, using the rest of the planting as a check. "The fertilized plot," he said, "almost doubled the per acre yield of the unfertilized plot."

To add further variety to his farming venture, Hadden decided to try out the commercial possibilities of popcorn, something no one in that vicinity had ever attempted. Starting on a small scale and finding the venture profitable, he has increased his plantings to 75 acres per year.

The best mixture of fertilizer, he finds, is 100 lbs. muriate of potash, 200 lbs. superphosphate, and 100 lbs. of nitrate of soda. His yields average about 20 bushels per acre.

When he began experimenting with popcorn, he found the popping expansion to be 21. In 1936 he had samples tested by the Kansas Experiment Station and Iowa State College, Ames, and got a reading of 32, which is the highest popping expansion known. He thinks, in view of the first and last test, which represent different fertilizer practices, that the fertilizer and the long growing season are responsible for the high popping expansion.

Hadden, a new kind of pioneer, is demonstrating a modern philosophy of farming, not on new but on old, worn-out land. He is proving the contention of the poet Sidney Lanier that "there is more in the man than there is in the land."

Sit-down Plowing

(*From page* 5)

of the meadows, and took his refuge in poetry and water-colors. Another lady put this same spirit of the open fields into embroidery and rugs, after the milk things were scrubbed!

Had these persons enjoyed the surplus leisure engendered by mechanical improvements, their avocations would have more fully served the task of bread-winning. One always returns stronger to a routine job after riding hobbies in leisure moments. But as things used to be, leisure came only with decrepit age and fading eyesight.

And in those unlovely times of toil any rural community grew suspicious and resentful of any person who was "quare," and who varied from its

Calvinistic standards. Yet I am happy to say that among the rolling hills of my state there stands a granite monument overtopping a splendid vista, dedicated by the emancipated sons of farming to the culture of a bucolic scholar. The grandsires of the lads who erected the stone thought the "darned old hermit" was loose in the steering gear. So we see, after all, that our ethics and our economics today square with each other better than of yore. That is, he who contributes to the common weal in any productive form is welcome to the brotherhood of agriculture, even though he does not anticipate hell-fire and brimstone every time he fails to speed the plow!

And while we are at it, let's tackle the case of those cooperative leaders who may not be as early afield or as late a-choring as somebody else, and who thereby get muttered about. Perhaps some of them kill more quack schemers abroad than they kill quack grass at home, and if so, maybe they have served the cause quite as nobly as the fellows who get the benefits of cooperation without leaving their milking to the "missus."

AT any rate, it's time enough to howl them down to earth when their families start fussing. Meanwhile, add them to the list of emancipated leaders who have found time in a mechanical age to make religion and economics run parallel. (Memo and insert) We exempt from this encomium all the petty-fogging "politikers" who abuse the name of cooperative enterprise. Do your own sorting by states!

Now that the hard-pressed ruralite has learned to sit down a trifle during working hours, thanks to artful inventors, he has still another hurdle to jump. As an individual and a cooperator in many enterprises, his present stunt is to discover how it feels to be a *consumer.*

Ever since I attended my first rock-ribbed cooperative "ruckshun" down at old Turnverein hall in the Townley days, the speakers and resoluters have kept blinders on the consuming side and stuck spurs in the flanks of production.

THEY chased the ghastly and wraithful middleman from melon patch to market place and prayed fervently for nothing nicer than his hide for a lap robe. In him they saw a selfish barrier to more consumer demands, which of course meant room for greater farm production. Always eagerly trying to get closer to the dear consumer (for trading reasons, not for love), producers forgot that all they required to find him was an ordinary looking-glass!

Price alone has been the goal sought by too many producers. The meat and milk makers want high prices for raw stuff on the hoof and in the can, washing their mitts of much responsibility after it leaves the farm. The somewhat resentful consumer wants low food prices, his wish often being echoed by his industrial employer.

Yet either extreme is bad medicine for both ends of the grub line. The American farmer knows his onions but he hasn't had to peel any to drag down the tears during recent flip-flops in food prices. As one cooperative shouter stated at a recent hullabaloo, "unbalanced production plus too many working hours brings on bumper storages, bankruptcy, and droopy prices; while if the farmer gets his sights too high on the price target Mister Consumer either shifts to a substitute, if there is any, or goes on relief or a strike, if there isn't."

The more the farmer grunts to lift himself up to some "guaranteed" price scheme, the tougher the consumer gets. But when things succeed in yanking down consumer quotations at food stores over any long period, then we get the red-hot climax to the poker party.

Then, fellow observers, you note how quickly both factions in the price squabble realize at least three nonsinkable facts, which I may recite to you briefly: First, that the farmer consumes a third of what the city food inhaler sells or makes; second, that Mrs. Consumer can find no surer way to set a miserable table than to crack down on the income of the rancher, the dairyman, and the gardener; and third, that regularity and uniformity of quality in food products really mean more to a growing family than prices. I hustle to add that as long as some poor, underprivileged kids must hunt crusts and take any kind of musty shelf goods and stringy boiling bones, then price *will* play too big a share in the situation. But normally, for the ordinary exchange between farmers and vitual buyers the wrong emphasis has been put on what the farmer gets and what the housewife pays.

THE distributive margin too has worried many honest folk into fits and foment, but like the w. k. drought and flood, it still maintains itself as part of the economic scenery, and mayhap always will. It seems that the more we request some college shark to tinker with another man's margin allowances, the less we get done about it. But just as we measure rainfall and draw isobars (without doing any remodeling of the climate withal) so we should keep a hawk-eye on those in-between food margins, for scientific and museum purposes at least. In a way, although shameful to admit it, the writing of blistering treatises on food margins helps to keep farmers in good mental trim for the bout that lies ahead.

But this thought is more important to the topic. If meanwhile the producer learns that he is an all-fired, double-A rated consumer of varieties galore, and that they need him as bad as he needs them; and if the misguided consumer acknowledges finally that he also is a bang-up producer seeking country customers, then maybe the "twain shall meet."

Yea, verily, when that cometh to pass perhaps East will be West, farming will be easy, and Europe and organized labor will be at peace!

YET I warn you now that if this happy millennium cannot arrive before we liberalize our constitution a trifle, we shall see the erection of tariff walls and the taxing of competitive foods between neighboring agricultural states. Right now the solons solemnly dozing their way into destinies and writing an occasional bit of statecraft have put a few grazing states into a pretty kettle of fish. Two of these ambitious state assemblies to my knowledge have tried to enact laws to forbid the importation of farm products in fresh state across their boundaries without labels and a small tax. Another freak proposal is intended to make every drop of milk shipped from one state into the metropolis adjoining it subject to the sole inspection and classification of the state of origin. That is a step toward naming the price limit I suppose. We have witnessed a senseless class struggle between a northern dairy state and a section of the South over butter substitute legislation, with boycotts and retaliations threatened on both sides.

So I feel that if our relatively relaxed and stimulating physical situation in farm life, due to unfettered labor, cannot point the way to a spot where we can do some real "sitting down" then we have missed the whole show. I mean a nook where we can sit down with the rest of the nation and get this studied out. Plans have been offered in high places for its solution, but theories won't turn the trick. Unless the ones who make the rumpus agree to arbitrate, then we might as well all go way back and sit down forever!

WHO ENRICHES THE SOIL ENRICHES LIFE

Ewing Galloway

HITCHED TO THE HORIZON

FERTILITY has always been a lodestar to the pioneering urge of the American farmer. Once it hitched his covered wagon to the horizon and sent him forth in search of the elusive land of milk and honey. Today it lures him to the laboratory where Science helps him to find fertile frontiers within his own fields.

The scientist blazes the trail toward a better life. The commercial man widens it into a highway. The fertilizer truck has replaced the prairie schooner. No longer must the farmer search for fertility. It is brought to his fields, scientifically correct and mechanically perfect.

The farmer, the scientist and the fertilizer man have found a land of milk and honey fairer than the fondest dreams of their forefathers. But the pioneering urge is still alive. The horizon is always just ahead. The common goal is a richer life.

POTASH PAYS · NV · POTASH EXPORT MY. · ON ALL CROPS · TRADE MARK REG.

A102

N.V. POTASH EXPORT MY., Inc., 19 W. 44th St., New York

FAMILY TROUBLES

Ethel (Aged six, combing hair): "Mama, what makes my hair crack when I comb it?"

Mama: "Why, dear, you have electricity in your hair."

Ethel: "Aren't we a funny family? I've got electricity in my hair and Grandma has gas on her stomach."

An Irishman got a job at a railway station. When the first train came in, however, he forgot the name of the station; so he called out: "Here ye are for where ye are going. All in there for here, come out."

YOUR CHOICE

Marie: "Yes, we had a lovely time; Jack's car passed everything on the highway."

Agnes: "Well, we had a good time, too; everything passed us!"

Proud Mother: "Yes, he's a year old now and he's been walking since he was eight months old."

Bored Visitor: "Really? He must be awfully tired."

Chloe: "Da's a purty shirt you boy friend's got on. Wonder how many yards o' dat goods hit took to make it?"

Caroline: "He done tole me he got two shirts like dat outen one yard las' night."

Husband: "I don't like to invite that fellow to dinner. He used to kiss you before we were married."

Wife: "Well, so did you."

Husband: "Yes, but I've gotten over it and chances are he hasn't."

START YOUNG

"Little boy, why aren't you in school?"

"Hell, lady, I ain't but three years old!"

"What kind of dress did Betty wear to the party last night?"

"I don't know, but I think it was checked."

"Boy, that must have been some party."

Ikey: "Will you please explain to me the difference between shillings and pence?"

Abie: "You can walk down the street without shillings."

Girl: "Did Jack give the bride away at the wedding?"

Boy Friend: "No, he let the groom find out for himself."

CAN YOU?

A girl can sing,
A girl can dance,
A girl can play crokay;
But she can't strike a match
On the seat of her pants,
'Cause she just ain't built that way.

MURIATE OF POTASH

62/63 K_2O. Also 50% K_2O

•

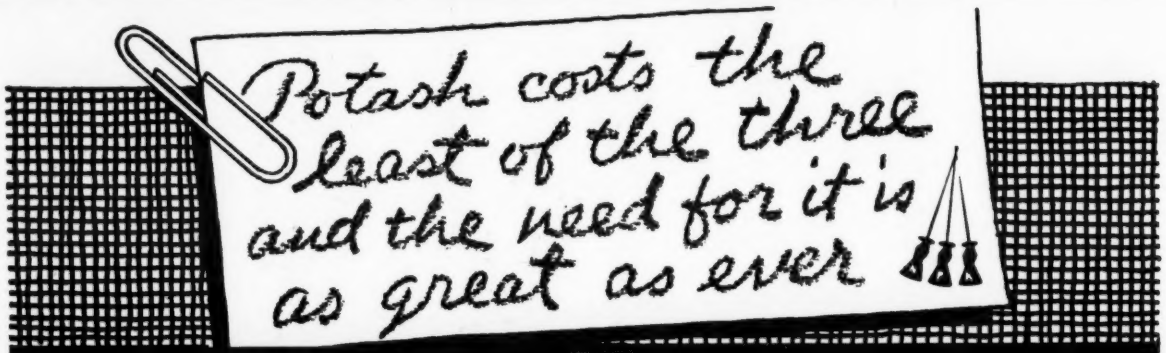
MANURE SALTS

Approximately 30% K_2O

Mine and Refinery located near Carlsbad, New Mexico

UNITED STATES POTASH COMPANY, INC.

30 Rockefeller Plaza, New York, N. Y.



This year, recommend a mix with a higher percentage of

Red Muriate

50% and 60% Grades
Manure Salts

POTASH COMPANY of America
MERCANTILE TRUST BLDG., BALTIMORE, MD.
SOUTHERN SALES OFFICE: ATLANTA, GA.
MORTGAGE GUARANTEE BLDG.

Printed in U.S.A.